CHAPTER 4

4.0 TRANSMISSION SYSTEM ALTERNATIVES – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter includes a description of the affected environment and expected direct, indirect, and cumulative impacts associated with proposed transmission system improvements described in Section 2.6 and shown in Figure 2-15. Transmission infrastructure, including corridors and switchyards, to support operation of a nuclear plant at the BLN site was identified, reviewed, and evaluated in the earlier environmental review documents prepared by TVA and the AEC for the original facility encompassing BLN 1&2. The AEC subsequently approved and issued a construction license for BLN 1&2 and the supporting transmission infrastructure into and at the site (TVA 2008a). The approved transmission system was constructed before the plant entered deferred status.

The 11 transmission lines that would need to be upgraded or reenergized to support operation of a single nuclear unit at the BLN site are listed in Table 2-1. Nine of the lines need to be reconductored or uprated. Sections of two 500-kV lines need to be connected and energized; ROW vegetation management on those deenergized segments will be brought back to current TVA standards. The Widows Creek-Bellefonte and Bellefonte-Scottsboro 161-kV lines would not need to be changed to support operation of a single nuclear unit at the BLN site. Additional description of proposed transmission line upgrades is provided in Section 2.6. As described in Section 2.6, no new transmission lines would be needed under either Action Alternative, and therefore no additional ROW would be required. In addition, the existing 500-kV switchyard would be refurbished.

The methods used to manage the infrastructure and maintain ROW for the lines would be unchanged. Prior to these activities, TVA archaeologists and biologists would conduct an SAR of the transmission line area (including the ROW) to identify any resource issues that may occur along that transmission line. These reviews are conducted on a recurring basis that coincides with the maintenance cycle, to ensure that the most current information is provided to the organizations conducting maintenance on these transmission lines. A summary of the SAR process is provided in Appendix D.

Only minor editorial changes have been made to Chapter 4 in the FSEIS. There were no comments on the DSEIS related to the proposed transmission system upgrades.

4.1. Surface Water

4.1.1. Affected Environment

The project areas of the proposed transmission line improvements drain to the Tennessee River and its tributaries at the following locations: (1) Guntersville and Wheeler reservoirs in Alabama, (2) at Nickajack and Chickamauga reservoirs in southeast Tennessee and northwest Georgia, and (3) upstream and downstream of Normandy Dam on the Duck River in central Tennessee. Table 4-1 identifies the major streams within the project area and their state designated use classification and 303(d) use impairment listing. Streams on a state 303(d) list do not fully support one or more of their designated uses and are included in a state program to eliminate the water quality impairment.

Table 4-1. State Classification and 303(d) Listing of Major Streams Crossed

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
Browns Ferry-Trinity 161-kV (ID: 10)			
Tennessee River-Wheeler	Ala.	S, F&W	No
Bakers Creek	Ala.	F&W	No
Browns Ferry-Athens 161-kV (ID: 11)	Ala.		
Tennessee River-Wheeler	Ala.	S, F&W	No
Round Island Creek	Ala.	F&W	No
Swan Creek	Ala.	F&W, A&I	Yes - nutrients
Town Creek	Ala.	F&W	No
Widows Creek-Bellefonte #1 500-kV[2] (ID: 6); Bellefonte-Madison 500-kV[2] (ID: 7)			
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Town Creek	Ala.	F&W	No
Mud Creek	Ala.	F&W	No
Crow Creek	Ala.	F&W	No
Big Coon Creek	Ala.	F&W	No
Little Coon Creek	Ala.	F&W	No
Widows Creek	Ala.	S, F&W	No
Widows Creek-Bellefonte #2 500-kV[3] (ID: 8); Bellefonte-East Point 500-kV[3] (ID: 9)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Coon Creek	Ala.	S, F&W	No
Widows Creek-Oglethorpe #2 161-kV[4] (ID: 4)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Widows Creek	Ala.	S, F&W	No
Long Island Creek	Ala.	PWS, S, F&W	No
Widows Creek-Oglethorpe #3 161-kV[4] (ID: 5)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Long Island Creek	Ala.	PWS, S, F&W	No
Guest Creek	Ala.	F&W	No
Tennessee River-Nickajack	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	Yes – dioxins, PCBs
Cole City Creek	Ga.	Fishing	No
Lookout Creek	Ga.	Fishing	Yes – nonpoint source pollution
Chattanooga Creek	Ga.	Fishing	Yes – nonpoint source pollution
Rock Creek	Ga.	Fishing, Trout Stream	No
Dry Creek	Ga.	Fishing	Yes – nonpoint source pollution
S. Chickamauga Creek	Tenn.	IWS, FAL, REC, LWW, IRR	Yes – *E. coli*, nutrients, other anthropogenic habitat loss

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
W. Chickamauga Creek	Ga.	Fishing	Yes – nonpoint source pollution
Widows Creek-Raccoon Mountain #2 161-kV (ID: 3)			
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Long Island Creek	Ala.	PWS, S, F&W	No
Guest Creek	Ala.	F&W	No
Tennessee River-Nickajack	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	Yes – dioxins, PCBs
Cole City Creek	Ga.	Fishing	No
Lookout Creek	Tenn.	IWS, FAL, REC, LWW, IRR	No
Sequoyah-Widows Creek 500-kV (ID: 2)			
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Sequatchie River	Tenn.	DWS, IWS, FAL, REC, LWW, IRR	No
Tennessee River-Nickajack	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	Yes – dioxins, PCBs
Suck Creek	Tenn.	FAL, REC, LWW, IRR	No
South Suck Creek	Tenn.	FAL, REC, LWW, IRR	Yes – loss of biological integrity
North Suck Creek	Tenn.	FAL, REC, LWW, IRR	Yes - pH
N. Chickamauga Creek	Tenn.	FAL, REC, LWW, IRR, TS	Yes – pH, physical substrate habitat problems
Tennessee River-Chickamauga	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	No
Wartrace-N. Tullahoma Tap 161-kV (ID: 1)			
Tennessee River-Kentucky	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	No
Duck River-Normandy	Tenn.	DWS, IWS, FAL, REC, LWW, IRR	No
Carroll Creek	Tenn.	FAL, REC, LWW, IRR	No
Duck River- Below Normandy	Tenn.	DWS, FAL, REC, LWW, IRR, TS	Yes – *E. coli*

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
Doddy Creek	Tenn.	FAL, REC, LWW, IRR	Yes – habitat loss from erosion, flow alteration
Garrison Fork	Tenn.	DWS, IWS, FAL, REC, LWW, IRR	No
Wartrace Creek	Tenn.	FAL, REC, LWW, IRR	Yes – *E. coli*

[1] Abbreviations for designated use classifications for **Alabama**: PWS—Public Water Supply, S—Swimming and Other Whole Body Water-Contact Sports, F&W—Fish and Wildlife. For **Tennessee**: DWS—Domestic Water Supply, IWS—Industrial Water Supply, FAL—Fish and Aquatic Life, REC—Recreation, LWW—Livestock Watering and Wildlife, IRR—Irrigation, NAV—Navigation, TS—Trout Stream

[2] Portions of the Widows Creek-Bellefonte #1 and Bellefonte-Madison 500-kV lines share a common ROW.

[3] Portions of the Widows Creek-Bellefonte #2 and Bellefonte-East Point 500-kV lines share a common ROW.

[4] The Widows Creek-Oglethorpe #2 and #3 161-kV lines are co-located.

4.1.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, because much of the subject lines are located on existing ROW, vegetation maintenance would continue to occur periodically, including the use of herbicides, which could possibly have an impact on groundwater resources. During ROW maintenance, the vegetation management guidelines and procedures as described in Appendix L would be followed. With the implementation of BMPs and routine precautionary measures, no additional impacts to surface water would likely occur related to the ongoing maintenance activities under the No Action Alternative.

Action Alternative

Soil disturbances associated with the use of or maintenance of access roads or transmission line upgrading activities could potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. Continued removal of the tree canopy along stream crossings can increase water temperatures and algal growth, decrease dissolved oxygen levels, and cause adverse impacts to aquatic biota. However, TVA routinely includes precautions in the design of its transmission line projects to minimize these potential impacts (see Appendices L and M [SOPs]). In the unlikely event that any new permanent stream crossings are necessary, these crossings would be designed to avoid impeding runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other upgrading and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all streamside management zones (SMZs) would be left undisturbed unless there were no practicable alternative (see Appendix N). Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. Any cumulative impacts to surface water quality are anticipated to be minor and insignificant.

4.2. Groundwater

4.2.1. Affected Environment

The affected transmission lines for the Action Alternative span several geographical areas. The geology and the groundwater contained within these areas are diverse, and for the purposes of this review, have been broken into geographic sections according to the physiographic province in which the transmission lines occur.

Northeast Alabama, Southeast Tennessee, and Northwest Georgia Sections
The six transmission lines proposed for upgrades in this section are Sequoyah-Widows Creek 500-kV (ID: 2); Widows Creek-Oglethorpe #2 161-kV (ID: 4); Widows Creek-Oglethorpe #3 161-kV (ID: 5); Widows Creek-Bellefonte #1 500-kV (ID: 6); Widows Creek-Bellefonte #2 500-kV (ID: 8); and Widows Creek-Raccoon Mountain #2 161-kV (ID: 3). These transmission lines are located across two physiographic provinces, i.e., the Valley and Ridge, and the Appalachian Plateaus.

The Valley and Ridge aquifer consists of folded and faulted carbonate, sandstone, and shale. Soluble carbonate rocks and some easily eroded shales underlie the valleys in the province, and more erosion-resistant siltstone, sandstone, and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges are the result of a combination of folding, thrust faulting, and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region. Carbonate-rock aquifers in the Chickamauga, the Knox, and the Conasauga groups are repeated throughout the Valley and Ridge Physiographic Province (Miller 1990).

Groundwater in the Valley and Ridge aquifers primarily is stored in and moves through fractures, bedding planes, and solution openings in the rocks. These aquifers are typically present in valleys and rarely present on the ridges. Most of the carbonate-rock aquifers are directly connected to sources of recharge, such as rivers or lakes, and solution activity has enlarged the original openings in the carbonate rocks. In the carbonate rocks, the fractures and bedding planes have been enlarged by dissolution of part of the rocks. Slightly acidic water dissolves some of the calcite and dolomite that compose the principal aquifers. Most of this dissolution takes place along fractures and bedding planes where the largest volumes of acidic groundwater flow.

Groundwater movement in the Valley and Ridge Province is localized, restricted by the repeating lithology created by thrust faulting. Older rocks, primarily the Conasauga Group and the Rome Formation, have been displaced upward over the top of younger rocks (the Chickamauga and the Knox groups) along thrust fault planes thus forming a repeating sequence of permeable and less permeable hydrogeologic units. The repeating sequence, coupled with the stream network, divides the area into a series of adjacent, isolated, shallow groundwater flow systems. The water moves from the ridges, where the water levels are high, toward lower water levels adjacent to major streams that flow parallel to the long axes of the valleys. Most of the groundwater is discharged directly to local springs or streams (Miller 1990).

Aquifers of the Appalachian Plateaus Physiographic Province consist of permeable stratigraphic units of Paleozoic sedimentary rocks. Major aquifers in the Appalachian Plateaus Province are in limestone units of Mississippian age covered by sandstone of the Pennsylvanian Pottsville Formation. Flow in the Appalachian Plateaus aquifers is affected primarily by topography, structure, and the development of solution openings in the rocks. A thick sequence of shale, sandstone, and coal overlies Mississippian limestone. Recharge to the aquifers is by precipitation on the flat, mesa-like plateau tops. Water then percolates downward through the Pennsylvanian sandstone (Pottsville Formation), primarily along steeply inclined joints and fractures. Some water leaks downward across the interbedded shale into the underlying limestone aquifer. Sandstone of the Pottsville Formation varies greatly in its water-producing capabilities. A thick black shale (the Chattanooga Shale) forms a confining unit for the Appalachian Plateaus aquifer (Miller 1990).

Public drinking water is supplied by both groundwater and surface water sources for the counties in which the ROWs are located (EPA 2009). Sequoyah-Widows Creek 500-kV (ID: 2) intersects a State Designated Source Water Protection Area, which is the recharge area for the Hixson, Tennessee, Utility District in Hamilton County; other State Designated Source Water Protection Areas may occur. Private wells occur throughout the area.

Middle Tennessee Section

The ROW of the Wartrace-N. Tullahoma Tap 161-kV (ID: 1) transmission line proposed for upgrading in this section is underlain by aquifers, from the Ordovician and Mississippian Periods, in the Interior Low Plateaus Physiographic Province. These aquifers are separated by a confining unit. These carbonate rocks are the principal aquifers in large areas of central Tennessee and are part of the Central Basin aquifer system. The carbonate rock aquifers consist of almost pure limestone and minor dolostone and are interlayered with confining units of shale and shaly limestone. Limestone is susceptible to erosion, which produces fissures, sinkholes, underground streams, and caverns forming vast karst areas.

The middle Ordovician, Stones River Group contains the most important carbonate-rock aquifers in the project area. The calcareous siltstones of the middle Ordovician Nashville Group yield small volumes of water, but these units are not considered to be principal aquifers. The lower Ordovician Knox Group is a major aquifer where dolostone contains freshwater (Lloyd and Lyke 1995).

Highland Rim aquifer system from the Mississippian Period consists of flat-lying carbonate rocks. The formations that make up the Highland Rim aquifer within this section of the project area are the Monteagle Limestone, the St. Genevieve Limestone, the St. Louis Limestone, the Warsaw Limestone, and the Fort Payne Formation (Lloyd and Lyke 1995). The bedrock formations weather to form a thick chert regolith, which stores and releases groundwater into fractures and solution openings in the bedrock (TDEC 2002).

Precipitation is the primary source of recharge in the Interior Low Plateaus Province. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil to the underlying bedrock. In the consolidated rocks, however, most of the water moves through and is discharged from secondary openings, such as joints, fractures, bedding planes, and solution openings. As a result, groundwater discharge from springs is common throughout the Interior Low Plateaus Province (Lloyd and Lyke 1995).

The carbonate rocks that form the Highland Rim aquifer are typical of karst systems. The term karst refers to carbonate rocks (limestone and dolostone) in which groundwater flows through solution-enlarged channels and bedding planes within the rock. Karst topography is characterized by sinkholes, springs, disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the connections between surface and underground features, water in karst areas is not distinctly surface water or groundwater.

Karst systems are readily susceptible to contamination, as the waters can travel long distances through conduits with no chance for natural filtering processes of soil or bacterial action to diminish the contamination. Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those that are under the direct influence of surface water.

Public drinking water for Coffee and Bedford counties in Tennessee is supplied by both surface water and groundwater sources (EPA 2009). Privately owned wells supply water to area restaurants, schools, and marinas in the county. Residential wells are likely to occur near the subject ROWs.

<u>North Alabama Section</u>
The Browns Ferry-Trinity 161-kV (ID: 10) and Browns Ferry-Athens Alabama, 161-kV (ID: 11) transmission lines proposed for upgrading are also underlain by the Highland Rim aquifer system, which is part of the Interior Low Plateaus Physiographic Province. However, the aquifer is known locally as the Tuscumbia-Fort Payne aquifer. The formations that make up this aquifer are the Fort Payne Chert, the Tuscumbia Limestone, and the Monteagle Limestone. The Chattanooga Shale is at the base of the Tuscumbia-Fort Payne aquifer and acts as a confining unit. The upper bedrock formations weather to form a thick regolith that covers the surface of the Fort Payne. The regolith may be as thick as 100 feet and is mostly clay, but may contain significant layers of chert rubble.

Like the rest of the Mississippian Highland Rim aquifer, fractures and solution openings have formed a network of interconnected caves, sinkholes, and springs throughout these formations.

The regolith[7] and underlying bedrock are hydrologically connected. Recharge to the aquifer is largely from precipitation infiltrating and moving through the regolith. Focused recharge also occurs from surface drainage into sinkholes or losing stream reaches that intersect the aquifer (Kingsbury 2003). Like the rest of the Highland Rim aquifer system, the aquifer is readily susceptible to contamination and is considered vulnerable to contamination.

Public drinking water for Limestone County, Alabama, is supplied by both surface water and groundwater sources. Public water for Morgan County, Alabama, is supplied by surface water (EPA 2009). Privately owned wells supply water to area restaurants, schools, and marinas in the county. Residential wells likely occur near the subject ROW.

4.2.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, vegetative maintenance would occur periodically, including the use of herbicides that could possibly have an impact on groundwater resources. During future revegetation and maintenance activities, application of herbicides and fertilizers would be avoided in the areas along the ROWs where sinkholes, caves, and State Designated Source Water Protection Areas occur to prevent groundwater contamination. Any herbicides applied to the ROWs during periodic maintenance would be applied

[7] Regolith refers to the layer of loose rock resting on bedrock, constituting the surface of most land.

according to the manufacturer's label. During ROW maintenance, the vegetation management guidelines and procedures as described in Appendix L would be followed. With the implementation of BMPs (Muncy 1999) and routine precautionary measures, potential impacts to groundwater under the No Action Alternative would be insignificant.

Action Alternative

Under the Action Alternative, anticipated impacts on existing ROWs from maintenance would be similar to those occurring under the No Action Alternative. Potential impacts to groundwater from upgrades of the transmission lines could result if sediments from disturbed soil enter or clog karst features, or from the transport of herbicides and fertilizers or other contaminants into sinkholes and caves. BMPs and routine precautionary measures, as described in the No Action Alternative, would be used during ROW maintenance and transmission line upgrades to control sediment infiltration from storm water runoff and to avoid contamination of groundwater in the project areas. Therefore, potential impacts to groundwater from the Action Alternative would be insignificant.

4.3. Aquatic Ecology

4.3.1. Affected Environment

As described in Section 4.1 (Surface Water) above, the surface water drainage from the proposed transmission line improvements drain to the Tennessee River and its tributaries at the following locations: (1) Guntersville and Wheeler Reservoirs (Jackson, Limestone, and Morgan counties in Alabama); (2) at Nickajack and Chickamauga Reservoirs in southeast Tennessee (Hamilton, Marion, and Sequatchie counties) and northwest Georgia (Catoosa, Dade, and Walker counties); and (3) upstream and downstream of Normandy Dam on the Duck River in central Tennessee (Bedford and Coffee counties).

TVA routinely monitors streams and reservoirs in the Tennessee River drainage as part of its Reservoir VS monitoring program, and various water quality initiatives. While not all streams potentially affected by transmission line activities have been assessed, those that have been assessed contain diverse aquatic communities (i.e., fish and invertebrates) representative of streams and reservoirs in the Cumberland Plateau, Eastern Highland Rim, Outer Nashville Basin, Plateau Escarpment, Sequatchie Valley, Southern Table Plateaus and Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregions.

4.3.2. Environmental Consequences

No Action Alternative

Routine maintenance (including vegetative maintenance) is ongoing on the ROWs of the transmission lines currently in service. Maintenance of access roads and transmission facilities can potentially expose soil and increase erosion that can lead to adverse impacts to water quality and aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts. TVA routinely includes precautions in maintenance of its transmission line projects to minimize these potential impacts (Muncy 1999).

ROW maintenance employs manual and low impact methods within SMZs wherever possible, and these practices would continue (see Appendix N). In areas requiring chemical treatment, only EPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor direct and indirect impacts to surface waters or aquatic habitats and the aquatic communities they support. No cumulative impacts are expected.

Action Alternative

The currently inactive 500-kV transmission lines would be reenergized as described in Section 2.6, and routine vegetation and access maintenance would be reestablished for their ROWs. The other transmission lines that would be upgraded are already in service. These lines undergo environmental review as part of TVA's vegetation maintenance program. Because these transmission lines are already in service and being maintained, upgrades associated with operation of a single unit at BLN would have no additional effects above those presently seen on these transmission ROWs. Existing data indicate that no important aquatic resources would be affected by reestablishing maintenance activities of the 500-kV lines or upgrading the other transmission lines currently in service. Field reviews will be conducted prior to vegetation clearing or line upgrade activities to confirm these findings. Appropriate SMZs would be established and maintained per TVA guidelines (Muncy 1999) (also see Appendices L, M, and N). Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No direct, indirect, or cumulative impacts to aquatic communities or instream habitat are anticipated.

4.4. Vegetation

4.4.1. Affected Environment

The proposed transmission line upgrades would occur across seven Level IV Ecoregions including the Cumberland Plateau, Eastern Highland Rim, Outer Nashville Basin, Plateau Escarpment, Sequatchie Valley, Southern Table Plateaus and Southern Limestone/Dolomite Valleys and Low Rolling Hills (Figure 4-1). The natural vegetation, along with geologic strata and predominant land use, varies considerably across the project area (Griffith et al. 1998; Griffith et al. 2001). Vegetation in the subject transmission line ROWs included in the proposed project is characterized by two main types: herbaceous vegetation and forest.

Herbaceous vegetation occurs on about 95 percent of the subject transmission line ROWs. Herbaceous vegetation is characterized by greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other types of vegetation, and it is typical of existing transmission line ROWs due to the repeated treatment of woody vegetation to maintain reliability of the transmission system. The type of herbaceous vegetation found in transmission line ROWs can vary, ranging from heavily disturbed areas with high cover of nonnative plants to dry sites dominated by native species that resemble prairie remnants. Some sections of transmission line occurring in areas with low relief likely contain wetland vegetation. Although the percent cover of native species varies considerably across the project area, the high level of disturbance typical of ROWs suggests many areas likely contain a large proportion of nonnative, invasive species.

Forest cover, which occupies 5 percent or less of the subject ROWs is likely deciduous in composition. Deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Deciduous forest occurs only in areas of ROW where the transmission line crosses very steep terrain and in areas where vegetation on existing, deenergized lines has not been maintained for some years. In forested areas with steep terrain the conductor is sometimes high enough above canopy trees such that regular removal of woody species is not necessary to maintain reliability

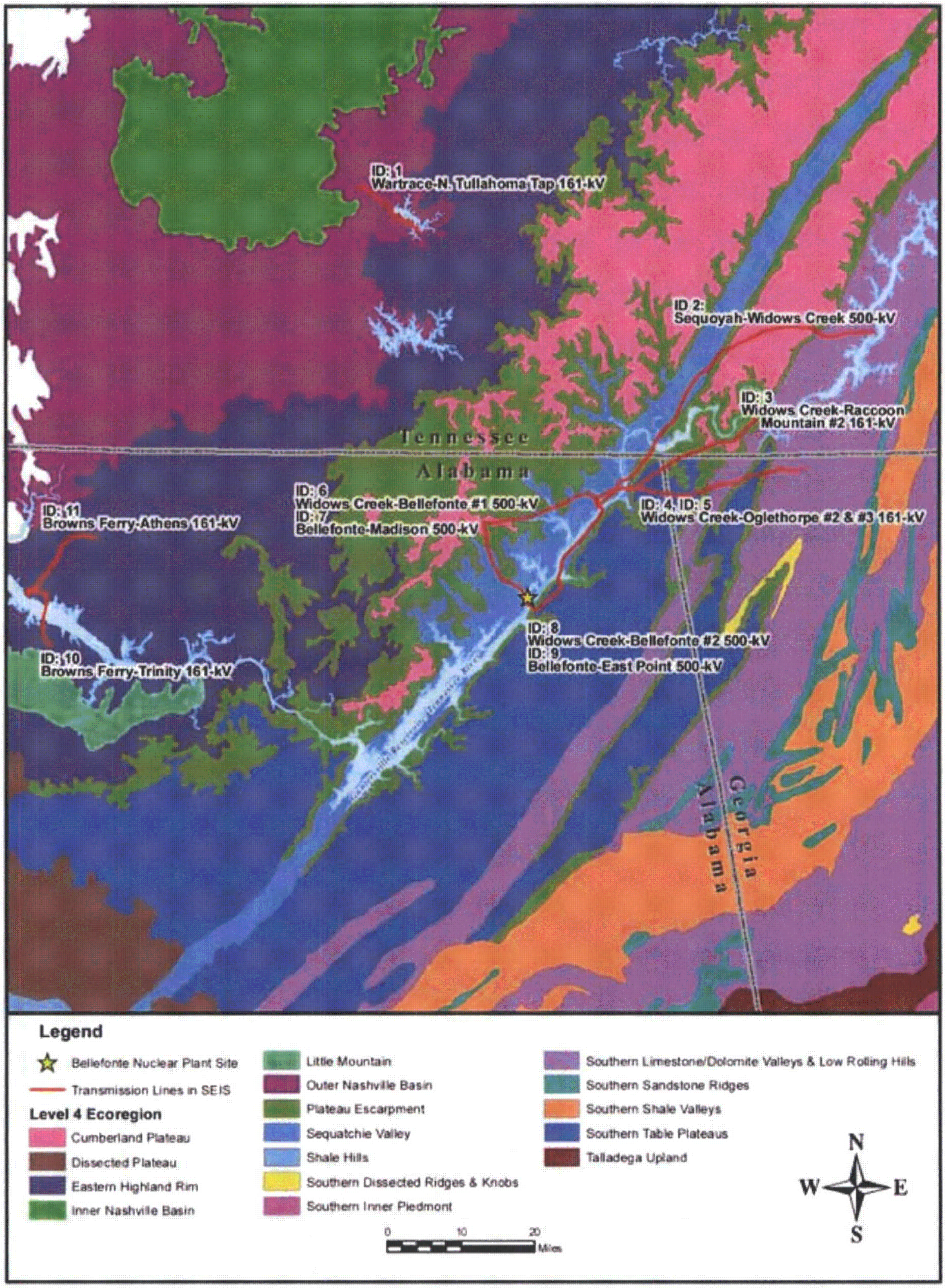

Figure 4-1. Level IV Ecoregions Crossed by Transmission Lines Requiring Upgrades or Actions to Support Operation of a Single Nuclear Unit at the BLN Site

of the transmission system. Because these spanned areas (i.e., those areas of high relief where the transmission is high above the canopy such that ROW clearing is not necessary) often contain relatively undisturbed forest, they are typically dominated by native species indicative of the region. Conversely, those forested areas within unmaintained ROWs along deenergized transmission lines are typically early successional and usually contain a greater proportion of nonnative, invasive species. These areas are typically dominated by saplings and/or small pole-sized trees.

4.4.2. Environmental Consequences

No Action Alternative

Under this alternative, the existing transmission lines would not be upgraded and the area within the ROWs would remain in its current condition. Methods used to manage vegetation along the ROW and maintain transmission infrastructure would be unchanged. Vegetation maintenance of the ROWs would continue, and portions of the ROW could be periodically disturbed by minor activities related to maintaining transmission infrastructure. TVA standard operating procedure of revegetating any disturbed areas with noninvasive species would help prevent introduction and spread of invasive species in the project area (Muncy 1999). Thus, adoption of the No Action Alternative would not affect plant life in the area of the proposed ROWs. The structure and composition of the vegetation would not be appreciably altered, under the No Action Alternative.

Action Alternative

Under this alternative, the existing transmission lines would be upgraded, and the methods used to manage vegetation along the ROWs and to maintain transmission infrastructure would be comparable to what currently occurs. However, botanical surveys of the ROWs that would occur as part of the process (see Subsection 2.6.4) could identify more federally listed or state-listed plants along those ROWs. If rare plants are observed, no aerial application of herbicide would take place along parts of the ROW inhabited by listed species. In areas that currently receive aerial applications of herbicides, local changes to vegetation structure and composition would likely occur if the application was suspended. These changes would have little ecological impact because any shifts in species composition would not change the early successional nature of the plant community.

Adoption of this alternative would not require new clearing of forest, although areas of herbaceous vegetation may need to be cleared to facilitate upgrading activities. Effects to herbaceous vegetation in the existing ROWs would be temporary and would not likely persist for more than approximately one year after activities cease. TVA standard operating procedure of revegetating with noninvasive species would help prevent introduction and spread of invasive species in the project area (Muncy 1999). Adoption of the Action Alternative would not significantly affect the botanical characteristics of the area in which the subject ROWs are located.

4.5. Wildlife

4.5.1. Affected Environment

Two types of terrestrial habitat occur in the transmission line ROWs associated with proposed generation at BLN. These include early-successional, i.e., herbaceous habitat, which occupies about 95 percent of the subject ROWs and forested habitat, which occupies the remaining 5 percent. A more detailed description of vegetation is provided in Subsection 4.4.1.

Early successional habitat occurs along most of the existing transmission line ROWs. Within this habitat type, the ROWs cross agricultural fields (occupying about 40 percent of the coverage), herbaceous or scrub-shrub (about 40 percent of the coverage), and maintained lawns or fields (approximately10 percent of the coverage). Some sections of the subject transmission line ROWs occur in areas with minor topographical relief. Such areas likely contain early successional emergent wetland habitat.

Birds commonly observed in early successional habitat include the Carolina wren, American robin, northern mockingbird, northern cardinal, eastern towhee, eastern bluebird, brown thrasher, field sparrow, eastern meadowlark, and European starling. Red-tailed hawk and American kestrel also forage along ROWs. Mammals frequently observed in this type of habitat include Virginia opossum, eastern cottontail, striped skunk, white-tailed deer, eastern mole, woodchuck, white-footed mouse, and hispid cotton rat. Coyote, bobcat, red fox, and gray fox also use ROWs that cross forest as corridors for travel and foraging. Common reptiles found along ROWs include black racer, black rat snake, milk snake, and garter snake. Wetlands within early successional habitats provide habitat for amphibians such as American toad, green frog, northern cricket frog, upland chorus frog, and red-spotted newt.

Forested habitat present within the existing ROWs is likely upland deciduous forest. Deciduous forest occurs only in areas where the transmission line crosses very steep terrain. In these spanned areas, the conductor is high enough above canopy trees that regular removal of woody species is not necessary to maintain reliability of the transmission system.

Deciduous forests provide habitat for wild turkey, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and American crow, as well as neotropical songbirds such as wood thrush, blue-gray gnatcatcher, red-eyed vireo, and ovenbird. White-tailed deer and gray squirrel are frequently found in deciduous forests, and scattered rock outcrops within these forests provide habitat for a variety of small mammals. Northern zigzag salamander and slimy salamander also inhabit the forest floor of deciduous forests. Common reptiles include eastern box turtle, northern ringneck snake, black rat snake, and northern copperhead.

Unique and important terrestrial habitats, such as caves, occur near the corridors. The TVA Natural Heritage database contains records of 215 caves within 3 miles of the existing transmission line ROWs. The closest cave records are approximately 0.25 mile from the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line in Marion County, Tennessee. All other known cave locations are greater than 0.5 mile from the ROWs.

Twelve heron colonies are reported within 3 miles of, but greater than 0.25 mile from, the subject ROWs. Except for seasonal aggregations of waterfowl along the Tennessee River, no other aggregations of migratory birds occur in the project area.

4.5.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, early-successional and forested habitat within the ROWs would be maintained at current proportions and thus would not result in changes to wildlife habitat. Methods used to manage vegetation along the ROW and maintain transmission infrastructure would be unchanged. Clearing of the ROWs for vegetation maintenance would continue to occur, and portions of the ROWs would be periodically disturbed by minor activities related to maintaining transmission infrastructure. Selection of the No Action Alternative would not result in adverse direct, indirect, or cumulative impacts to terrestrial animals.

Action Alternative
Adoption of the Action Alternative would not require new clearing of forest, although areas of vegetation within some ROWs may need to be recleared to facilitate maintenance activities. Some ROWs likely have undergone secondary succession, resulting in establishment of young trees. The removal of the taller vegetation within these areas may temporarily displace larger animals. Some smaller animals occupying the areas, such as mice, shrews, frogs, and salamanders, also may move into adjacent areas during upgrading and maintenance activities. Following the upgrading and reestablishing maintenance activities of any sites, wildlife favoring edge and early successional habitats would reoccupy these areas.

There are records of 215 caves and 12 heron colonies within 3 miles of the ROWs. However, because caves and heronries are greater than 0.25 mile from the ROWs, adoption of the Action Alternative would not result in adverse impacts to these resources. TVA biologists would perform field surveys to confirm these findings prior to reclearing the ROWs for the 500-kV lines and upgrading the transmission lines currently in service. If previously undocumented resources are identified within these ROWs during the surveys, appropriate protective buffers would be placed around those resources. Most work would be restricted to areas immediately surrounding existing ROWs. Because known terrestrial animal resources within the ROWs are regionally abundant and protective measures would be taken to protect newly discovered sensitive resources, selection of the Action Alternative would not result in adverse direct, indirect, or cumulative impacts to terrestrial animals.

4.6. Endangered and Threatened Species

In accordance with Section 7 of the ESA, TVA has prepared a BA of potential effects to federally listed animals and plants from proposed completion/construction and operation of a nuclear plant at the BLN site, including the proposed transmission system improvements (TVA 2009d). Fifty-two plants and animals federally listed as endangered, threatened, candidate for listing, or protected under the Bald and Golden Eagle Protection Act potentially occur in potentially affected areas. Results of the analysis prepared for the BA indicate proposed actions along transmission lines are not likely to adversely affect any federally listed species or adversely modify critical habitat. TVA received concurrence with these determinations from the USFWS in a letter dated December 7, 2009 (See Appendix H).

4.6.1. Aquatic Animals

4.6.1.1. Affected Environment

As described in Section 4.1 of this document, the project areas of the proposed transmission line improvements drain to the Tennessee River and its tributaries at the following locations: (1) Guntersville and Wheeler Reservoirs (Jackson, Limestone, and Morgan counties in Alabama); (2) at Nickajack and Chickamauga Reservoirs in southeast Tennessee (Hamilton, Marion, and Sequatchie counties) and northwest Georgia (Catoosa, Dade, and Walker counties); and (3) upstream and downstream of Normandy Dam on the Duck River in central Tennessee (Bedford and Coffee counties).

Federally listed aquatic species known to be present in streams in counties in the areas crossed by one or more of these transmission lines are listed in Table 4-2. State-listed animal species are provided in Appendix O, Table O-1.

Table 4-2. Federally Listed Aquatic Animal Species Present in Counties Affected by Proposed Transmission Line Upgrades

Common Name	Scientific Name	Federal Status
Snails		
Anthony's river snail*#	*Athearnia anthonyi*	LE
Armored snail	*Pyrgulopsis pachyta*	LE
Owen spring limnephilid caddisfly	*Glyphopsyche sequatchie*	C
Royal marstonia	*Pyrgulopsis ogmorhaphe*	LE
Slabside pearlymussel	*Lexingtonia dolabelloides*	C
Slender campeloma*	*Campeloma decampi*	LE
Mussels		
Alabama lampmussel#	*Lampsilis virescens*	LE
Alabama moccasinshell	*Medionidus acutissimus*	LT
Birdwing pearlymussel	*Lemiox rimosus*	LE
Cracking pearlymussel	*Hemistena lata*	LE
Cumberland bean	*Villosa trabalis*	LE
Cumberland combshell	*Epioblasma brevidens*	LE
Cumberland monkeyface	*Quadrula intermedia*	LE
Cumberland pigtoe	*Pleurobema gibberum*	LE
Dromedary pearlymussel	*Dromus dromas*	LE
Fine-lined Pocketbook	*Lampsilis altilis*	LT
Fine-rayed Pigtoe#	*Fusconaia cuneolus*	LE
Fluted kidneyshell	*Ptychobranchus subtentum*	C
Orange-foot Pimpleback	*Plethobasus cooperianus*	LE
Pale lilliput#	*Toxolasma cylindrellus*	LE
Pink mucket*#	*Lampsilis abrupta*	LE
Ring pink	*Obovaria retusa*	LE
Rough pigtoe*	*Pleurobema plenum*	LE
Sheepnose	*Plethobasus cyphyus*	C
Shiny pigtoe pearlymussel#	*Fusconaia cor*	LE
Slabside pearlymussel*	*Lexingtonia dolabelloides*	C
Southern pigtoe	*Pleurobema georgianum*	LE
Spectaclecase	*Cumberlandia monodonta*	C
Tan riffleshell	*Epioblasma florentina walkeri*	LE
Tuberculed blossom pearlymussel	*Epioblasma torulosa torulosa*	LE
Turgid blossom pearlymussel	*Epioblasma turgidula*	LE
Fish		
Boulder darter	*Etheostoma wapiti*	LE
Palezone shiner#	*Notropis albizonatus*	LE
Slackwater darter	*Etheostoma boschungi*	LT

Common Name	Scientific Name	Federal Status
Snail darter	*Percina tanasi*	LT
Spotfin chub	*Cyprinella monacha*	LT
Yellowfin madtom	*Noturus flavipinnis*	LT

Species that are known to occur in watersheds directly affected by construction activities are indicated by (*).

Species reported from Jackson County, Alabama are indicated by (#)

Status Codes: LE = Listed endangered; LT = Listed threatened; C = Candidate for Federal Listing

4.6.1.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, because the proposed project is on existing ROW, no impacts to federally listed or state-listed aquatic organisms would result from transmission infrastructure upgrades or ongoing routine maintenance that would continue.

Action Alternative

The currently inactive 500-kV transmission lines would be reenergized as described in Section 2.6, and routine vegetation and access maintenance would be reestablished for their ROWs. The other transmission lines that would be upgraded are already in service. These lines undergo environmental review as part of TVA's vegetation maintenance program. Because these transmission lines are already in service and being maintained, upgrades associated with operation of a single unit at BLN would have no additional effects above those presently seen on these transmission ROWs.

Routine maintenance of access roads and transmission facilities can potentially expose soil and increase erosion that could lead to adverse impacts to water quality, thereby affecting aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts. TVA routinely includes precautions in maintenance of its transmission line projects to minimize these potential impacts (Muncy 1999).

ROW maintenance would employ manual and low-impact methods within SMZs wherever possible (see Appendix N). In areas requiring chemical treatment, only EPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable impacts to aquatic life impacts. Broadcast aerial application of herbicides adjacent to streams containing federally listed species would be prohibited.

Existing data indicate that no important aquatic species would be affected by reestablishing maintenance of the 500-kV lines or upgrading the other transmission lines currently in service. Field reviews will be conducted prior to vegetation clearing or line upgrade activities to confirm these findings. If habitats for any federally or state-listed animal species occur, measures to avoid and/or minimize impacts would be taken such that no significant impacts to sensitive aquatic species or their habitats occur. With the proper implementation of these controls no direct, indirect, or cumulative impacts on federally or state-listed aquatic species or their habitats are anticipated.

4.6.2. *Plants*

4.6.2.1. Affected Environment

Review of the TVA Natural Heritage database (queried September 2009) indicates that 12 occurrences of nine state-listed species and one occurrence of one federally listed species have been documented within the transmission ROWs subject to proposed upgrades (see Table 4.3 and Appendix O, Table O-2). Additionally, five federally listed, one candidate for federal listing, and 108 state-listed plant species occur within 5 miles of the proposed transmission line upgrades. Five other federally listed and one other candidate for federal listing are known from counties where the transmission line upgrades would occur, but are greater than 5 miles away from the ROWs. No designated Critical Habitat for plant species occurs in the project area.

Table 4-3. Federally Listed Terrestrial Plant Species Known Within and Near (Within 5 Miles) the ROWs Subject to Upgrades/Actions and From the Counties Where Work Would Occur

Common Name	Scientific Name	Federal Status
Price's potato-bean	*Apios priceana*	THR
American Hart's-tongue fern[2]	*Asplenium scolopendrium* var. *americanum*	THR
Morefield's leather-flower[2]	*Clematis morefieldii*	END
Leafy prairie-clover[2]	*Dalea foliosa*	END
Small whorled pogonia	*Isotria medeoloides*	THR
Fleshy-fruit gladecress[2]	*Leavenworthia crassa*	C
Mohr's Barbara's Buttons	*Marshallia mohrii*	THR
Monkey-face orchid	*Platanthera integrilabia*	C
Green pitcher plant[2]	*Sarracenia oreophila*	END
Large-flowered skullcap[1]	*Scutellaria montana*	THR
Chaffseed[2]	*Schwalbea americana*	END
Virginia spiraea	*Spiraea virginiana*	THR

Status codes: C = Candidate; END = Endangered; THR = Threatened.

[1]Federally listed plant species documented from the ROWs where work would occur.

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

The federally listed large-flowered skullcap has been documented from the ROW of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line and the surrounding forests. According to the TVA Natural Heritage database, the most recent survey of the site was a 2002 visit when one individual plant was observed in the transmission line ROW. The large-flowered skullcap plant documented from the ROW is likely an aberrant and ephemeral individual; it is widely accepted that the preferred habitat for the species is forest (NatureServe 2009; USFWS 2002; Bridges1984). The state-listed rose-gentian and fame-flower have also been observed along the Sequoyah-Widows Creek 500-kV ROW. Two separate occurrences of rose-gentian have been documented along the transmission line. The species preference for open areas suggests that more occurrences of the species likely occur along the ROW, which provides one of the largest sources of consistently open habitat in that section of the Cumberland Plateau. Rose-gentian is endemic to the Cumberland Plateau and adjacent foothills of the Ridge and Valley physiographic province and is considered rare and imperiled across its range (NatureServe 2009).

During a 2008 botanical survey of the Widows Creek-Oglethorpe #2 and #3 161-kV (ID: 4 and ID: 5) transmission line ROWs, TVA botanists observed multiple, previously unreported occurrences of state-listed species. Yellow giant-hyssop (two occurrences), dwarf larkspur, Dutchman's breeches, American columbo, Barrens St. Johnswort, and Eggleston's violet were all observed in portions of the ROW underlain by limestone-derived soils. With exception of Dutchman's breeches, which was found in a spanned section of ROW with a forest overstory, all species occurred in open parts of the ROW dominated by herbaceous species. Between 500 and 1000 Small's stonecrop were estimated to occur in an area of exposed sandstone along the ROW. All occurrences of state-listed species observed along the Widows Creek-Oglethorpe #2 and #3 161-kV transmission lines appeared healthy and viable, and all have been exposed to periodic vegetation clearing associated with ROW maintenance.

One population of fame-flower was also observed along the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line ROW. This occurrence contained about 100 plants and was last observed in 2004.

Habitat for the majority of the species listed in Table 4-3 and Appendix O (Table O-2) potentially occurs in the subject transmission line ROWs. Rare plant species that inhabit forested areas may occur in the spanned sections of ROW where woody vegetation has not been removed and species capable of occupying open areas with higher light conditions could inhabit multiple locations along the ROW. TVA botanists would perform appropriately timed field surveys for federally and state-listed plant species along the affected ROWs before any upgrading or maintenance activities begin.

4.6.2.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the existing transmission lines would not be reenergized or upgraded, and methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged. Aerial application of herbicide would continue to be prohibited in areas where federally listed and state-listed species occur or potentially occur in existing ROWs. Known locations of rare plants would also continue to be avoided during routine maintenance of transmission infrastructure. Therefore, adoption of the No Action Alternative would have no significant impacts on endangered, threatened, and rare plant species.

Action Alternative

Under the Action Alternative, the proposed upgrades to the transmission lines would require some level of vegetation disturbance on existing ROWs. Federally listed and state-listed species have been previously documented along small portions of these ROWs. It is reasonably likely that additional listed species would be identified in the project area during the appropriately timed botanical surveys that would be conducted prior to any ground-disturbing work. During these surveys, all sites where species have been previously reported would be resurveyed to determine if the rare species are still present and the full extent of the plants in the ROW. If, after botanical surveys, rare plants are identified in the project area, the following mitigation measures would be used to reduce or eliminate impacts to the species:

- Areas with federally listed plant species would be included in the transmission line and access road engineering design specification drawings used during the planning and implementation of the upgrades. TVA botanists would help fence these areas to ensure construction crews would avoid the sites. Depending on the species present, construction may be timed so work takes place during the dormant season when plants are less likely to be harmed by construction. Any new structures would be placed to avoid impacting these areas. Additionally, access roads and the associated vehicle traffic would be excluded from these areas.

- Areas where state-listed species occur in the project area would be avoided unless there is no practical alternative. Avoidance measures would be comparable to those used for federally listed plants.

Any federally listed or state-listed plant species observed during field surveys most likely occupy either relatively undisturbed, spanned portions of ROW where woody vegetation has not been cleared, or areas where vegetation is maintained regularly to ensure that woody species do not interfere with the transmission lines. The proposed actions would not require clearing in areas that are currently spanned. Thus, with the implementation of the above mitigation measures, the habitat where listed species occur would not be appreciably different under the Action Alternative. Therefore, the proposed actions under the Action Alternative are not likely to adversely affect federally listed species and would not significantly impact state-listed species.

4.6.3. Wildlife

4.6.3.1. Affected Environment

The TVA Natural Heritage database indicated that three federally listed terrestrial animal species (gray bat, Indiana bat, red-cockaded woodpecker), one federally protected bird (bald eagle), and 14 state-listed terrestrial animal species have been reported within 3 miles of the subject ROWs (Table 4-4 and Appendix O, Table O-3). Populations of six uncommon species tracked by the Alabama or Tennessee Natural Heritage Programs were also reported (Table 4-5). No designated Critical Habitat for terrestrial animals occurs within the ROWs of the subject transmission lines.

Table 4-4. Federally Listed Terrestrial Animals Reported From Jackson, Limestone, and Morgan Counties, Alabama; Dade, Catoosa, and Walker Counties, Georgia; and Bedford, Coffee, Hamilton, Marion, and Sequatchie Counties, Tennessee

Common Name	Scientific Name	Federal Status
Birds		
Bald eagle	*Haliaeetus leucocephalus*	-[1]
Red-cockaded woodpecker	*Picoides borealis*	LE
Mammals		
Gray bat	*Myotis grisescens*	LE
Indiana bat	*Myotis sodalis*	LE

Status abbreviation: LE = Listed Endangered

[1]Federally protected by the *Bald and Golden Eagle Protection Act*

Table 4-5. Number of Federally Listed or State-Listed Species of Terrestrial Animals, Caves, and Migratory Bird Aggregations Within 3 Miles of Each Transmission Line Associated With the Action Alternative

Transmission Line Identification Number	Number of Federal Species[1]	Number of State Species (Tracked Species[2])	Number of Caves Within 3 Miles	Number of Migratory Bird Aggregations Within 3 Miles
1	2	3 (1)	10	0
10	0	1 (1)	6	0
11	0	0 (0)	0	0
4, 5	2	4 (2)	39	2
3	3	7 (3)	27	3
7	2	0 (1)	115	2
2	3	8 (3)	16	10
9	1	3 (0)	11	3
6, 8	1	0 (2)	69	1

[1]Includes federally protected species (i.e., bald eagle)

[2]Species tracked by Alabama, Georgia, or Tennessee State Natural Heritage Programs

Gray bats roost in caves year-round and typically forage over streams, rivers, and reservoirs. Foraging habitat exists along the Tennessee River and associated riparian corridors throughout the project area. Numerous populations of gray bats exist throughout the region. The closest known occurrence of gray bats is approximately 0.25 mile from the Widows Creek-Raccoon Mountain #2 161-kv (ID: 3) transmission line. A second population is reported 0.5 mile from the Wartrace-N. Tullahoma Tap 161-kV (ID: 1) transmission line. Numerous caves occur in the vicinity of the existing transmission line corridors and offer potential gray bat roosting habitat (Table 4-5). However, gray bats have not been reported from these caves.

Indiana bats roost in caves during the winter and typically roost under the bark of dead or dying trees during the summer (Menzel et al. 2001). Optimal summer roosts occur in forests with an open understory and available roost trees, usually near water (Romme et al. 1995). Indiana bats forage primarily in forested habitats. The closest record of Indiana bats occurs in a cave approximately 1.1 mile from Sequoyah-Widows Creek 500-kV (ID: 2) transmission line. Although no other records of Indiana bats occur in the project area, other caves may provide suitable hibernacula[8], and mature forested habitat in the area provides suitable summer habitat for this species.

Habitat for red-cockaded woodpecker consists of open, mature pine woodlands, and rarely deciduous or mixed pine-hardwoods located near pine woodlands. Optimal habitat is characterized as a broad savanna with a scattered canopy of large pines and a dense groundcover containing a diversity of grass, forb, and shrub species, historically maintained by fire. Nesting and roosting occur in tree cavities (USFWS 1980). Historical records for red-cockaded woodpecker exist in Walker County, Georgia, approximately 1.8 miles from the Widows Creek-Oglethorpe #3 161-kV (ID: 5) transmission line. Suitable habitat does not exist within the transmission line ROWs. The species is thought to be extirpated from Walker County, and does not exist in the ROWs.

Bald eagles were removed from the endangered species list in June 2007, but are still protected by *Migratory Bird Treaty Act* and the *Bald and Golden Eagle Protection Act*. This species

[8] Hibernacula are places, e.g., caves or other protected areas, where bats hibernate during the winter.

typically nests near large bodies of waters including lakes, rivers, and riparian wetlands. Bald eagles are fairly common within the region, especially near the Tennessee River. Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. The closest active bald eagle nest is located at Raccoon Mountain Pumped Storage Facility, less than 0.12 mile from a transmission line ROW. Nesting and foraging habitat exists near (less than 0.5 mile) portions of the existing ROWs.

Barking tree frogs occur in wetlands, and a population is known from New Hope, Tennessee. This record is approximately 2 miles northwest of the closest associated transmission line ROW for Sequoyah-Widows Creek 500-kV (ID: 2) transmission line. Emergent wetlands within the ROW may offer moderately suitable habitat for this species.

Green salamanders primarily inhabit shaded rock outcrops in moist forests between 500 and 1,300 meters in elevation. Breeding females require cool, clean, and moist horizontal crevices or narrow chambers in which to suspend their eggs from an overhead substrate (NatureServe 2009). This habitat is abundant along the numerous stretches of escarpment along the Cumberland Plateau and Sand and Lookout mountains in the area. Records for green salamander exist within 3 miles of five different transmission lines: Widows Creek-Raccoon Mountain #2 161-kV (ID: 3); Widows Creek-Oglethorpe #2 161-kV (ID: 4); Widows Creek-Oglethorpe #3 161-kV (ID: 5); Widows Creek-Bellefonte #2 500-kV (ID: 8); and Bellefonte-East Point 500-kV (ID: 9).

Hellbenders inhabit medium-sized to large free-flowing streams in the Tennessee and Cumberland River drainages. Inhabited streams possess large rocks or logs that provide shelter and breeding sites. Records for hellbender are located in Morgan County, Alabama, and Bedford and Marion counties, Tennessee. Limited suitable habitat exists within the project area.

Tennessee cave salamanders occur in caves with streams free of sedimentation (Cooper 1968). One known locality exists approximately 0.5 mile away from the closest transmission line, the Wartrace-N. Tullahoma Tap 161-kV (ID: 1). There also are historical records of this salamander from Nickajack Cave before it was flooded by Nickajack Reservoir. Suitable habitat still exists in portions of Nickajack Cave beyond the influence of the reservoir. Suitable habitat for this species does not exist within the power line corridors.

Bachman's sparrows inhabit early successional, old field habitat that contains a high density of grasses and forbs, scattered trees and shrubs with an open understory (Dunning and Watts 1990). Although this species uses the beginning stages of early successional habitat, this habitat only remains suitable for a short time. The species may temporarily use early successional habitats along the existing transmission line ROWs within the project area as they are periodically cleared.

Cerulean warblers have been reported from Marion County, Tennessee, within 3 miles of the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line. The species occurs largely in contiguous, mature deciduous forests, particularly along floodplains or along moist ridge tops. Mature forest adjacent to existing ROWs within the project area may provide habitat for this species. With the possible exception of the forested portions of ROWs on steep hillsides, suitable habitat for this species does not exist within project ROWs.

Ospreys typically nest along rivers, lakes, and reservoirs. The species nests in trees or on man-made structures (i.e., transmission towers, channel markers, bridges, mooring cells) within or over water (NatureServe 2009). Ospreys nest throughout the study area, primarily along the Tennessee River.

Peregrine falcons have been reported from the ROWs of the subject transmission lines area. The species typically nests on exposed cliffs in undisturbed areas, near water, and close to plentiful prey (Burleigh 1958). Suitable habitat for peregrine falcons exists along exposed escarpment on Sand, Lookout, and Cumberland mountains.

The subject ROWs are located within the northern edge of the breeding range of Swainson's warbler, a neotropical songbird. Breeding habitat for this species ranges from deciduous floodplain and swamp forests to moist lower slopes of mountain ravines at elevations to 900 meters. Swainson's warblers typically require areas with deep shade from both canopy and understory cover (NatureServe 2009). The species has been reported along Lookout Creek, near Chattanooga, Tennessee. Suitable habitat for this species within the existing ROWs is unlikely.

Allegheny woodrats occur in rocky bluffs, caves, and other rocky habitats (Whitaker and Hamilton 1998). Numerous caves and small rock outcrops within the project area provide suitable habitat for this species.

Common shrews occupy most terrestrial habitats excluding areas with very little or no vegetation. Thick leaf litter in damp forests may represent favored habitat, although this species appears adaptable to major successional disturbances. Suitable habitat is abundant both within the project area and throughout the region.

Eastern big-eared bats roost in caves, abandoned buildings, or in hollow trees. The species has been reported from a cave in Marion County, Tennessee, that is greater than 1 mile from a ROW. Other caves in the project area offer suitable habitat for big-eared bats.

Eastern small-footed bats roost in rock crevices, caves, bridges, and other rocky habitats. The species has been reported from Nickajack Cave in Marion, Tennessee. Although no other records of eastern small-footed bats occur in the project area, caves in the project area provide suitable habitat for the species.

4.6.3.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, no impacts to federally listed or state-listed terrestrial animal species would occur as a result of the proposed transmission infrastructure upgrades. Under this alternative, the existing transmission lines would not be upgraded, and the methods used to manage vegetation along the ROW and maintain transmission infrastructure would be unchanged. Routine maintenance would continue.

Action Alternative

Under the Action Alternative, the proposed upgrades to the transmission lines would require some level of disturbance on existing ROWs. Federally listed and state-listed species and their habitat have been previously documented near some ROWs. Listed terrestrial animal species could be identified in the project area during field surveys associated with future maintenance and upgrading activities. If listed terrestrial animals or their associated habitat are observed in the existing ROWs, the following mitigation measures would be used to reduce or eliminate impacts to listed species:

- Depending on the species present, timing restrictions on construction may be implemented. For example, work may be timed to take place outside of the breeding season (such as for nesting bald eagles or ospreys) when species are less likely disturbed by the activity.
- Buffers may be placed around suitable habitat restricting clearing activities within a protective radius (e.g., a 200-foot radius around cave openings, hand clearing only).

The proposed project would not require clearing in areas that are currently spanned. Any listed terrestrial animal species identified within these forested ROWs would not be impacted. With implementation of the above mitigation measures, the habitat where listed species occur would not be appreciably different after upgrading takes place. Therefore, the proposed actions under the Action Alternative are not likely to adversely affect federally or state-listed species.

Prior to energizing the transmission lines associated with BLN, TVA will investigate presence of osprey nests on substation and transmission line structures in the BLN project area. Should nests exist, they would be removed to insure that ospreys are not harmed when the transmission lines are energized. Removal of these nests would be coordinated with the USFWS and/or the U.S. Department of Agriculture, Animal and Plant Health Information Service (APHIS). Removal would be conducted outside the breeding/nesting periods (March – July). Impacts to ospreys are considered insignificant given the abundance of nesting habitat around the BLN site.

4.7. Wetlands

4.7.1. Affected Environment

Wetland areas are likely located within the length of the transmission line corridors proposed to transmit power from the BLN site (Figure 2-15). These corridors cross a landscape dominated by agricultural fields and scattered residential, commercial, and industrial properties between prominent ridge lines, river valleys, associated tributaries, and wetland floodplain complexes. These corridors cross five large-scale watersheds (Guntersville Reservoir, Chickamauga Reservoir, Duck River, Sequatchie River, and Wheeler Reservoir) and 37 local watersheds, all within the Tennessee River Basin. The wetland areas located within these watersheds provide necessary wetland functions for flood abatement, sediment retention, pollutant absorption, and wildlife habitat. The transmission lines proposed for upgrade cross the following significant wetland floodplain complexes: Round Island Creek and associated tributaries, Poe Branch, Chickamauga Creek, Raccoon Creek, Glover Creek, Mud Creek, and Robinson Creek. Based on NWI Data, Soil Survey Geographic Data (USDA-NRCS 2009), USGS topographic maps, and aerial photography, a conservative estimate of 150 acres of potential wetland area occurs on the ROWs proposed for upgrade activities. Because of previous and ongoing ROW maintenance, the majority of wetland habitat within the transmission line corridor, previously mapped or unmapped, would be comprised of emergent or scrub-shrub habitat. Forested wetlands potentially occur along the edges of the ROWs.

Actual wetland acreage within the ROWs will be confirmed and delineated by field surveys prior to upgrades that have the potential to impact wetlands within the ROWs. Wetland delineations would be performed according to USACE standards (Environmental Laboratory 1987), which require documentation of hydrophytic (i.e., wet site) vegetation (USFWS 1996), hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997; U.S. Department of Defense and EPA 2003). Broader definitions of wetlands, such as provided in EO 11990 (Protection of Wetlands), Alabama state regulations, the USFWS (Cowardin et al. 1979), and the TVA

Environmental Review Procedures (TVA 1983b) would also be considered in making the delineations.

4.7.2. *Environmental Consequences*

Activities in wetlands are regulated under Sections 401 and 404 of the CWA and are addressed by EO 11990. In order to conduct specific activities in jurisdictional wetlands, authorization would be obtained under a Section 404 Permit from the USACE and under Section 401 from the respective state regulatory agency. In addition, proposed activities would comply with EO 11990, which requires all federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out their responsibilities.

No Action Alternative

Under the No Action alternative, current ROW maintenance and operations of the subject transmission lines would continue. However, no alterations or improvements would be made to the existing transmission lines for the purpose of transmitting power generated from BLN. Therefore, no additional direct, indirect, or cumulative effects to wetlands would occur under this alternative.

Action Alternative

Under the Action Alternative, initial improvements to upgrade approximately 222 miles of existing transmission lines would take place. This would include some reestablishment of ROW vegetation management, filling associated with structure replacement, and vehicular access along the ROWs. Any improvement activities conducted within a wetland would be performed under specific wetland BMPs (TVA 1992) to minimize wetland impacts. This includes conducting work in dry conditions, use of low ground pressure equipment or ground mats, broadcast spray of herbicides approved for aquatic environments, installation of silt fence as needed, and reseeding disturbed areas with native wetland species. Ongoing maintenance would be conducted using similar BMPs and measures to protect wetlands and conserve wetland functions.

Prior to all proposed upgrade activities, TVA would conduct a ground survey to determine the exact extent of any wetland areas located within the corridors proposed for upgrade. Based on this review, specific measures may be implemented to ensure no significant impacts or loss of wetland function occurs as a result of the transmission line upgrade activities. These commitments would result in avoidance strategies, minimization measures, or mitigation should wetland functions be compromised. Mitigation would be provided if substantial quality and quantity of forested wetland would be cleared to accommodate a wider ROW, if fill is proposed for switching-station construction, or for any other activity that reduces the functional capacity of a specific wetland. BMPs would be in place for upgrade activities, and ground surveys would take place to identify wetland areas where avoidance, minimization, or mitigation measures would be required. Therefore, no significant impacts to potentially affected wetland areas within the ROWs are anticipated from the transmission line upgrades.

4.8. Floodplains

4.8.1. *Affected Environment*

The transmission line routes cross numerous 100-year floodplain areas in several counties in Alabama, Tennessee, and Georgia. The 161-kV and 500-kV switchyards existing on the BLN site are located on the Town Creek embayment side. With respect to Town Creek, the 100-year floodplain is the area lying below elevation 601.4 feet msl. The Flood Risk Profile (FRP) elevation is 603.1 feet msl. The FRP is used to control flood damageable development for TVA projects, and residential and commercial development on TVA lands. At this location, the FRP elevation is equal to the 500-year flood elevation. The existing switchyards are located outside of the 100-year floodplain and above the FRP elevation.

4.8.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, the proposed switchyards and transmission lines would not be reenergized or upgraded. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Therefore, no additional effects to floodplains are likely.

Action Alternative
Consistent with EO 11988, an overhead transmission line and related support structures are considered to be a repetitive action in the 100-year floodplain. Activities conducted within existing switchyards would occur outside the 100-year floodplain. If any new substations, switchyards, or other support facilities need to be constructed to support these transmission lines they would be evaluated prior to construction to ensure compliance with EO 11988. Therefore, any activities occurring in the substations would be consistent with EO 11988 and floodplains would not be affected.

4.9. Natural Areas

4.9.1. Affected Environment

A review of the TVA Natural Heritage database indicated that the transmission lines proposed for reenergizing or upgrading would cover 11 counties in three states, and the lines are within 3 miles of, or cross, 68 natural areas and three Nationwide Rivers Inventory (NRI) streams.

This section addresses natural areas that are crossed by, immediately adjacent to, or within 3 miles of BLN associated transmission line upgrades. Natural areas include managed areas, ecologically significant sites, and streams listed on the NRI.

- Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, U.S. Department of Agriculture Forest Service (USFS), State of Tennessee, Jackson County) to protect and maintain certain ecological and/or recreational features.
- Ecologically significant sites are either tracts of privately owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant but not specifically managed by TVA's Natural Areas Program.
- Streams listed on the NRI are free-flowing segments of rivers recognized by the National Park Service (NPS) as possessing remarkable natural or cultural values.

Nine managed areas and ecologically significant sites and two NRI-listed streams are crossed by the existing transmission lines proposed for upgrades associated with operation of a single nuclear unit at the BLN site and are described below. Two NRI-listed streams are within 3 miles of the proposed transmission line upgrades and are described below. The remaining 58 natural areas located within 3 miles of the proposed transmission line upgrades/actions are listed in Table 4-6 by transmission line ID number or grouping of transmission line ID numbers within nearest proximity.

Table 4-6. Natural Areas Within 3.0 Miles of the Transmission Lines Proposed for Reenergizing or Upgrade

Line ID Number	Natural Area	Steward	Distance from Line (miles)
10, 11	Mallard Fox Creek State Wildlife Management Area (WMA)	ADCNR	0.7 west
	Swan Creek State WMA	ADCNR	1.7 east
4, 5, 9	Bellefonte Island TVA Small Wild Area (SWA)	TVA	1.2 west
	Mud Creek State WMA	ADCNR	1.6 west
	Crow Creek Refuge State WMA	ADCNR	0.4 west
	Chickamauga and Chattanooga National Military Park	NPS	0.6 southeast and northeast
	Glades and Barrens of Chickamauga Battlefield	NPS	2.1 southeast
	Lulu Falls/Eagle Cliff Potential National Natural Landmark (PNNL)	NPS	0.57 south
6, 8	Neversink Pit PNNL	NPS	0.5 east
	Robinson Spring PNNL	NPS	1.1 west
	Section Bluff TVA SWA	TVA	2.6 south
	Tumbling Rock Cave PNNL	NPS	2.4 west
3	Bill McNabb Gulf	Ecologically significant site on Tennessee River Gorge Lands*	2.5 northwest
	Blowing Springs Branch. Chesnutt Bridge Protection Planning Site (PPS)	Ecologically significant site on Tennessee River Gorge Lands*	2.2 northwest
	Bluff Point /Hicks Mountain	Ecologically significant site on Tennessee River Gorge Lands*	0.62 north
	Cummings Lake	Ecologically significant site on Tennessee River Gorge Lands*	1.05 north
	Ellis Spring	Ecologically significant site on Tennessee River Gorge Lands*	2.1 north
	Hicks Gap Designated State Natural Area (SNA)	TDEC	1.1 west
	Huff Branch TVA Habitat Protection Area (HPA)	TVA	0.74 north
	Kelly's Ferry Slopes	Tennessee River Gorge Trust	1.06 west
	Lassiter Property	Tennessee River Gorge Trust	1.5 north
	Nickajack River State Mussel Sanctuary	TWRA	1.9 northwest
	Parker Gap Cove	Ecologically significant site on Tennessee River Gorge Lands*	2.6 north
	Piney Branch Bottomland	Ecologically significant site on Tennessee River Gorge Lands*	1.4 northwest
	Pot Point	Tennessee River Gorge Trust	1.1 north
	Renfro Property	Tennessee River Gorge Trust	0.4 north
	Shortleaf Pine Flat PPS	Ecologically significant site on USFS lands*	1.55 northwest

Line ID Number	Natural Area	Steward	Distance from Line (miles)
2	Chickamauga State WMA	TWRA	2.1 north
	Chigger Point TVA HPA	TVA	1.18 east
	Cumberland Trail State Park	Tennessee State Parks	3.0 east, 0.1 north
	Dry Creek Ravine	Ecologically significant site on Tennessee River Gorge Lands*	2.6 east
	Hamilton County Park	Hamilton County	2.3 south
	Harrison Bay State Recreation Park	TDEC	1.44 south
	Little Cedar Mountain TVA SWA/HPA	TVA	1.14 east
	Marion Bridge TVA HPA	TVA	1.9 west
	Marion County Park	Marion County	1.4 southeast
	Mile 434 Oaks	Ecologically significant site on Tennessee River Gorge Lands*	2.7 east
	Montlake/Walden Ridge PNNL	NPS	0.2 northeast
	Nickajack Cave TVA HPA	TVA	0.1 east
	Nickajack Cave State Wildlife Observation Area (WOA)	TVA/TWRA	0.1 east
	Nickajack Oak Wetland and TVA HPA	TVA	0.1 west
	North Chickamauga Creek Pocket Wilderness	Bowaters Paper Company Southern	0.2 north
	Prentice Cooper State Forest	USFS	0.8 east
	Pryor Property	Tennessee River Gorge Trust	1.2 east
	Sequatchie Cave Designated SNA	TDEC	2.5 west
	Shellmound Road Bluff TVA HPA	TVA	1.7 south
	Smith Property	Tennessee River Gorge Trust	0.6 east
	Soddy Creek and TVA HPA	TVA	1.8 north
	Tennessee River Blueway	TVA	0.3 east
	Ware Branch Bend TVA HPA	TVA	2.4 north
	University of Tennessee Friendship Forest	University of Tennessee Forestry Experiment Station	1.4 east
1	Normandy State WMA	TWRA	0.4 northeast
	Bedford State Fishing Lake	TWRA	1.4 northeast
	Rutledge Falls	Tennessee River Gorge Trust	2.4 east
	Short Springs Designated SNA	TDEC	0.5 south
	Short Springs TVA SWA	TVA	0.65 southeast
	Yell Cave	Ecologically significant site on private land*	0.36 northeast

*ESS sites occur on the lands identified but are not managed by these entities.

Guntersville Reservoir State Mussel Sanctuary is crossed by a segment of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line at the section of the reservoir located in Marion County, Tennessee. The mussel sanctuary extends from the section of the Tennessee River from Nickajack Dam (TRM 424.7) downstream to the Tennessee-Alabama state line (TRM 416.5) and is designated as a sanctuary in which the taking of aquatic mollusks by any means, and/or the destruction of their habitat is prohibited at all times. This mussel sanctuary is managed by the Tennessee Wildlife Resources Agency (TWRA) Region III office.

Coon Gulf TVA Small Wild Area (SWA) is located in Jackson County, Alabama, approximately 1.0 mile northeast of BLN property boundary and is crossed by a segment of the Bellefonte-East Point 500-kV (ID: 9) transmission line. Coon Gulf SWA comprises approximately 2,366 acres managed by TVA and features a forested cove on Guntersville Reservoir. Coon Gulf provides habitat for federally listed and state-listed endangered species.

Raccoon Creek State Wildlife Management Area (WMA) is located in Jackson County, Alabama, approximately 3.0 miles northeast of BLN property boundary and is crossed by a segment of the Bellefonte-East Point 500-kV (ID: 9) transmission line. Raccoon Creek WMA comprises approximately 7,080 acres managed by ADCNR Division of Wildlife and Freshwater Fisheries for waterfowl and small game hunting.

Crow Creek State WMA is located in Jackson County, Alabama, approximately 1.8 miles north of Cedar Grove and is crossed by a segment of the Widows Creek-Bellefonte #1 500-kV (ID: 6) transmission line. Crow Creek WMA comprises 2,161 acres managed by ADCNR Division of Wildlife and Freshwater Fisheries for waterfowl and small game hunting.

Raccoon Mountain Pumped Storage State Wildlife Observation Area (WOA) is located in Marion County, Tennessee, approximately 3.0 miles west of Chattanooga and is crossed by a segment of the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line. Raccoon Mountain WOA comprises approximately 860 acres managed by TVA in cooperation with TWRA. This large pumped-storage lake on top of Raccoon Mountain is surrounded by mature forests and open areas and provides habitat for many bird species, including wintering bald eagles, hawks, falcons, common loons, and vultures.

Tennessee River Gorge is located in Marion and Hamilton counties, Tennessee, approximately 5.0 miles west of Chattanooga. The southern edge of the Tennessee River Gorge boundary is crossed by a segment of the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line. The protected area of the Tennessee River Gorge comprises 16,777 acres of the total 27,000-acre gorge. This gorge is the fourth largest canyon in the eastern United States. This ecologically significant site is managed by The Tennessee River Gorge Trust and has an unusually concentrated diversity of land forms and provides habitat for several varieties of plants, ferns, trees, grasses, and flowers, as well as a rich wildlife population. There are federally listed plant and animal species located throughout the gorge.

Grant Property is located in Marion County, Tennessee, approximately 5.0 miles southwest of Chattanooga within the boundary of the Tennessee River Gorge. The southern edge of the Grant Property is crossed by a segment of the Widows Creek-Raccoon Mountain #2 (ID: 3) transmission line. This area is owned in fee by the Tennessee River Gorge Trust in cooperation with the University of Tennessee-Chattanooga for research purposes. The Grant Property comprises approximately 888 acres and contains wooded slopes, mixed mesophytic forest and cove hardwood forest, with land forms characterized by karst topography exhibiting numerous sinkholes and caves. There are federally listed plant and animal species located on the property.

North Chickamauga Creek Gorge and Designated State Natural Area is located in Hamilton County, Tennessee, approximately 7.0 miles west of SQN and is crossed by the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line. The North Chickamauga Creek Gorge consists of approximately 39,000 acres, and the Designated State Natural Area comprises approximately 3,700 acres of the total acreage. This area is managed by the Tennessee Department of Environment and Conservation (TDEC) in cooperation with the North Chickamauga Creek Conservancy, and includes a rugged steep gorge cut by Chickamauga Creek into a sandstone plateau. River-side shoals and stream bars provide habitat for several listed plants.

Duck River State Mussel Sanctuary is located in Bedford and Coffee counties, Tennessee, and is crossed by the Wartrace-N. Tullahoma tap (ID: 1) at the section of Normandy Reservoir Reservation. The mussel sanctuary, managed by TWRA, extends from Kettle Mills Dam (Duck River Mile 105.6) upstream to the headwaters of the Duck River, including the section impounded by Normandy Dam

The Sequatchie River, an NRI-listed stream, is located in Marion and Sequatchie counties, Tennessee. The Sequatchie River Mile (SRM) 0, its confluence with Tennessee River, to SRM 109 in its headwaters approximately 10 miles south of Homestead is the segment listed on the NRI. This segment is crossed at six locations by the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line proposed for upgrades associated with BLN site operations. The NPS recognizes this 109-mile segment for its scenic, recreational, geologic, fish, and wildlife values, and it is noted as a clean, pastoral float stream that flows through a narrow scenic valley. The first crossing point of the river north of the BLN site is located approximately 0.4 miles north of the town of Ebenezer and west of State Route 27. The second stream crossing occurs 2.07 miles east of Nickletown and west of State Route 27. The third stream crossing occurs at 1.8 miles northeast of Nickletown and west of State Route 27. The fourth, fifth, and sixth stream crossings occur north of the town of Oak Grove at 0.4 mile, 0.8 mile, and 1.6 miles, respectively.

The segment of the North Chickamauga River located in Hamilton and Sequatchie counties, Tennessee, from SRM 13 (its confluence with Falling Water Creek southeast of Falling Water) to SRM 31 (the headwaters north of Lone Oak) is listed on the NRI. This river is crossed at two locations by the existing Sequoyah-Widows Creek 500-kV (ID: 2) transmission line proposed for upgrades associated with BLN site operations. The NPS recognizes this 18-mile segment for its scenic, recreational, geologic, fish, wildlife, historical, and cultural values, and it is noted as a spring-fed, crystal clear mountain stream featuring a variety of flora and an abundance of wildlife. The first crossing point of the river north of the BLN site is located approximately 3.7 miles north of the town of Fairmont on the Sequatchie and Hamilton county line. The second stream crossing occurs approximately 0.5 mile northeast of the town of Mile Straight at Dayton Pike Road.

Little Sequatchie River, located in Marion County, Tennessee, is designated as an NRI-listed stream from river mile 0, at the confluence with the Sequatchie River, to river mile 25 near the headwaters west of Palmer. This stream is located approximately 1.2 miles west of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line proposed for upgrades associated with BLN site operations. The NPS recognizes this 25-mile segment for its scenic, recreational, fish, and wildlife values, and it is noted as a scenic stream that supports game fishery.

4.9.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, no alterations or improvements would be made to existing facilities for the purpose of nuclear power generation including associated upgrades of transmission lines. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Therefore, there would be no additional effects to natural areas under this alternative.

Action Alternative
Nine natural areas and two NRI streams crossed by the transmission lines would be directly affected by disturbance of vegetation within the area and at stream crossings from heavy equipment associated with the upgrades. Activities necessary to upgrade transmission lines are short term and occur on existing ROW with no new clearing beyond the ROW. BMPs and other routine measures would be implemented to mitigate impacts. Managers of the natural areas crossed by the transmission lines would be notified prior to beginning proposed work. Because the proposed work is confined to existing ROW and because appropriate BMPs would be implemented, direct impacts to natural areas crossed by the transmission lines would be minor. The other natural areas listed in Table 4-6 would not be directly or indirectly affected. Impacts associated with implementation of this alternative would not result in cumulative adverse impacts to natural areas.

4.10. Recreation

4.10.1. Affected Environment

Some low-density dispersed recreation activity such as hunting or wildlife observation may currently take place within these existing transmission line corridors. Two developed recreation areas occur adjacent to the transmission line corridors. A segment of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line crosses Nickajack Dam Reservation and passes within a few hundred feet of a boat ramp and fishing berm on the right bank and a fishing pier on the left bank below the dam. The Wartrace-N. Tullahoma 161-kV (ID: 1) transmission line crosses Normandy Dam Reservation and passes within 200 feet of Duck River access facilities maintained by TVA as part of the reservation.

4.10.2. Environmental Consequences

No Action Alternative
Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Routine maintenance of these transmission lines and ROWs would have minor impacts on any informal recreation use or developed recreation within the area, and no mitigation would be required.

Action Alternative
Minor impacts on informal and developed recreation could occur during routine maintenance of lines and ROWs, as described in the No Action Alternative. Actions related to upgrading these transmission lines and ROWs could have a minor affect on any informal recreation use that currently occurs. Because these lines already exist and do not directly cross over developed recreation facilities on Nickajack and Normandy Reservations, any impacts on developed recreation facilities should be minor. Further, any impacts on dispersed recreation should be negligible and no mitigation required.

4.11. Land Use

4.11.1. Affected Environment

The transmission lines that would be upgraded cross land with a wide variety of land uses: agriculture, residential, commercial, and forest.

4.11.2. Environmental Consequences

No Action Alternative
Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. However, no additional changes in land use would occur under the No Action Alternative.

Action Alternative
Some temporary disruption of some land uses particularly agriculture could occur during upgrade activities. TVA would appropriately compensate land owners for any damage including damage to growing crops. Under this alternative, upgrades to transmission lines in the existing ROWs would not change any existing land use.

4.12. Visual Resources

4.12.1. Affected Environment

The physical, biological, and man-made features seen in the landscape provide any selected geographic area with particular visual qualities and aesthetic character. The varied combinations of natural features and human alterations that shape landscape character also help define their scenic importance. The presence or absence of these features along with aesthetic attributes such as uniqueness, variety, pattern, vividness, and contrast make the visual resources of an area identifiable and distinct. The scenic value of these resources is based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures, and visual composition seen in each landscape.

The existing transmission line routes traverse a variety of topography through several counties in Alabama, Tennessee, and Georgia. The existing 161-kV and 500-kV switchyards are located on the BLN site. The existing transmission lines and associated structures can be seen in the foreground distance (within 0.5 mile of the observer), middleground distance (between 0.5 and 4 miles), and background distance (4 miles to the horizon) by area residents and motorists along local roads. In some areas, views of the transmission lines and structures provide discordant contrast when seen as a focal point and standing alone. In other areas, the line route is visually similar to other transmission structures seen in the landscape.

4.12.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, the existing switchyards and transmission line ROWs would not be upgraded. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Thus, there would be no change in visual character, and visual resources would not be affected.

Action Alternative
Under the Action Alternative, the existing switchyards and transmission lines would be upgraded. For residents along Town Creek near BLN, upgrade of the existing switchyards and transmission lines would be visually insignificant. Views of the upgrades would be visually similar to existing views residents now have from foreground distances.

For residents, motorists, and lake-users along the existing line routes, most visual impacts would be temporary and minor. These groups would likely notice an increase in traffic and personnel along local roads and access roads. New conductors, structures, and height extensions would add to the number of discordantly contrasting elements seen in the landscape. Visual impacts would likely decrease as viewing positions increase, in distance, from the transmission line upgrades. Details of views from background distances tend to merge into broader patterns and details become weak.

Upgrades to the transmission line route would require some limited reclearing of vegetation. These activities could include the use of heavy machinery and would increase the number of personnel seen in the area. These minor visual obtrusions would be temporary until the existing ROW and laydown areas have been restored through the use of TVA standard BMPs (Muncy 1999). Any nighttime lighting required would be temporary during the upgrade period and would be insignificant. There may be some minor visual discord during the upgrade period due to an increase in personnel and equipment and the use of laydown and materials storage areas. This would be temporary until all activities are complete.

4.13. Archaeological Resources and Historic Structures

4.13.1. Affected Environment

TVA's procedure for reviewing the operations and maintenance of transmission lines is called a Sensitive Area Review (SAR) (see Appendix D). Under this review procedure, all transmission line corridors, where routine operation and maintenance occur, are reviewed by TVA Cultural Resource staff for the potential to effect historic properties on or eligible for the National Register of Historic Places (NRHP). The regulatory guidance for the SAR concerning cultural resources is the same guidance for all cultural resource assessments: 36 CFR Part 800. Prior to conducting specific upgrades and other activities along the ROWs, TVA would determine the need for consultation with the respective State Historical Preservation Officer (SHPO) and, if needed, define an APE in coordination with the SHPO. That requirement would range from no investigations (area already surveyed) to resurvey (if past surveys were not deemed sufficient) to site avoidance, data recovery, or monitoring if a previously or newly identified cultural resource within the APE was determined eligible or potentially eligible for inclusion in the NRHP.

The archaeological record of the Tennessee River valley has documented five major prehistoric occupational periods that began with the Paleo-Indian (14,000 to 8000 B.C.); the Archaic (8000 to 900 B.C.); the Woodland (900 B.C to A.D. 1000); the Mississippian (A.D. 1000 to 1630); and Historic (1630 to present) periods. Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. European interactions with Native Americans in this area began in the 17th and 18th centuries. European settlements vary throughout the regions in this study, but in general, Euro-American settlement increased in the early 19th century as the Historic tribes were forced to give up their land. Sites belonging to each period are differently distributed in the landscape of Tennessee, Alabama, and Georgia, but generally, habitation sites are found on floodplains and alluvial terraces along rivers and tributaries, while specialized campsites tend to be found on older alluvial terraces and in the uplands.

For the proposed transmission line upgrades associated with construction of a single BLN unit, the archaeological APE is all lands upon which the existing transmission line would be upgraded and includes all associated infrastructure, including the transmission line ROW, access roads, and staging areas. The APE for architectural studies includes a 0.8-kilometer (0.5-mile) buffer surrounding the subject transmission line ROWs.

Based on available data of previously recorded cultural resources, 25 archaeological sites are located within the APE. One of these sites located in Alabama (1MG785) is no longer extant. Seven sites, all located in Alabama (1MG116, 1MG115, 1MG667, 1MG758, 1MG757, 1JA304, 1JA694), were previously determined not eligible for inclusion on the NRHP. Two sites, one in Alabama (1MG735) and one in Georgia (9WA164) have been previously determined potentially eligible for the NRHP. The remaining 15 sites in Alabama (1JA637, 1JA650, 1JA453, 1JA452, 1JA304, 1JA377, 1JA518, 1JA532, 1JA524, 1JA617, 1JA558) and Tennessee (40MI246, 40MI247, 40HA0089, 40MI248) have not been assessed for NRHP eligibility. In Alabama, one previously recorded historic district (the City of Bridgeport) falls within the architectural APE. A portion (8 percent, 2.5 miles) of one transmission line proposed for upgrading, the Widows Creek-Oglethorpe #3 161-kV (ID: 5), has been subjected to a systematic cultural resources survey (Cleveland et al. 1995). This cultural resource survey identified one NRHP-eligible historic archaeological site (9WA164), one eligible Historic District (Happy Valley Farms in Walker County, Georgia) and two eligible historic structures (WA-WA-114 and WA-WA-642).

4.13.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the transmission line upgrades would not take place, and there would be no additional impacts to cultural resources from ongoing maintenance of existing transmission lines and ROWs.

Action Alternative

Portions of the transmission line ROWs proposed for upgrading are located in areas having a potential for archaeological resources. In addition, 17 previously recorded archaeological sites have been determined eligible or have not been assessed for eligibility for the NRHP. Under the Action Alternative, the upgrade of the existing transmission lines and the construction and/or use of associated infrastructure (e.g., access roads, laydown areas) have the potential to affect archaeological resources located within the APE that may be eligible for the NRHP. The placement of new structures or project-related clearing within the existing transmission line ROW could potentially have a visual effect on historic structures eligible for the NRHP.

In letters dated September 10, 2009, TVA initiated consultation with the Tennessee, Alabama, and Georgia SHPOs regarding the proposed transmission line upgrades. Should the Action Alternative be selected, pursuant to Section 106 of the NHPA and its implementing regulations at 36 CFR Part 800 TVA would conduct surveys to better identify and evaluate historic properties (archaeological sites, historic structures, and historic sites) eligible for listing in the NRHP. The cultural resources investigations would be guided by MOAs with Georgia SHPO (executed April 29, 2010) and Alabama SHPO (pending). Instead of an entering into an MOA, the Tennessee SHPO has requested that TVA follow procedures to conduct a phased identification and evaluation of historic properties pursuant to 36 CFR Part 800.4(b)(2).

4.14. Socioeconomics

Socioeconomics is the combination of social and economic factors related to the proposed action. Socioeconomic impacts may be positive, such as increased income, or negative, such as traffic congestion or temporary increases in demand for medical services.

4.14.1. Affected Environment

The transmission lines proposed for upgrades associated with operations of the BLN site would cover 11 counties in three states, as shown in Figure 2-15.

4.14.2. Environmental Consequences

No Action Alternative

Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Selection of the No Action Alternative would not affect local socioeconomic conditions because there would be essentially no change in current conditions.

Action Alternative

The actions required to reenergize the existing 500-kV lines and switchyard are discussed in the CLWR FEIS (DOE 1999), Subsection 5.2.3.9.1; the Conversion FEIS (TVA 1997); Subsection 4.2.18.2; and the COLA ER (TVA 2008a), Subsection 3.7.2.2. The transmission upgrades and refurbishments would be a small piece of the total construction effort for BLN, accounting for only a small share of expenditures and employment. In addition, as discussed in Subsection 2.6.2, these activities would be confined to the existing transmission line ROWs. Therefore, these impacts are considered to be minor.

Post-construction effects of reenergizing the 500-kV line and switchyard are discussed in the CLWR FEIS (DOE 1999), Subsection 5.2.3.9.1, and the Conversion FEIS (TVA 1997), Subsection 4.2.18.2. They are also discussed in the COLA ER (TVA 2008a), Subsections 5.8.1.4 and 5.6.3. Measures would be undertaken (see Subsection 2.6.2) to prevent or mitigate induced electric current and noise impacts, and to minimize public exposure to electric and magnetic fields. Therefore, these potential impacts are considered to be minor and insignificant.

4.15. Environmental Justice

4.15.1. Affected Environment

Environmental justice implies that low-income or minority populations will not incur a disproportionate share of adverse effects. Environmental justice analysis is mandated by EO 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. TVA is not subject to this EO, but it assesses the impact of its actions on minority communities and low-income populations in the NEPA process as a matter of policy.

4.15.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative there would be no upgrades to the subject transmission lines. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. There would be no impacts on businesses, industries, and residences in the area. Therefore, no significant disproportionate impacts to low-income or minority populations would occur under this alternative.

Action Alternative

All work would involve existing facilities and ROWs. No businesses, industries, and residences in the area not already affected by the existing transmission system would be affected beyond the minor and temporary effects. Therefore, no significant disproportionate impacts to low-income or minority populations would occur should the Action Alternative be implemented.

4.16. Operational Impacts

4.16.1. Electric and Magnetic Fields

4.16.1.1. Affected Environment

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

The fields from a transmission line are reduced by mutual interference of the electrons that flow around and along the conductors and between the conductors. The result is dissipation of the already low energy. Most of this energy is dissipated on the ROW, and the residual very low amount is reduced to background levels near the ROW or energized equipment.

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with (1) the strength of the electric or magnetic field, (2) the size and shape of the conducting object, and (3) whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field.

The transmission lines subject to upgrades, like other transmission lines, have been designed to minimize the potential for such shocks. This is done, in part, by maintaining sufficient clearance between the conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and highway guard rails that are near enough to the transmission line to develop a charge would be grounded by TVA to prevent them from being a source of shocks.

Under certain weather conditions, high-voltage transmission lines, such as 500-kV and 161-kV lines, 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 the ROW would be well below the levels that can produce interference with speech. Corona is not associated with any adverse health effects in humans or livestock.

Other public interests and concerns have included potential interference with AM radio reception, television reception, satellite television, and implanted medical devices. If interference occurs with radio or television reception, it would be due to unusual failures of power line insulators or a poor alignment of the radio or television antenna and the signal source. Both conditions are correctable and would be repaired if reported to TVA.

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

Research has been done on the effects of EMF on animal and plant behavior, growth, breeding, development, reproduction, and production. This research has been conducted in the laboratory and under environmental conditions, and no adverse effects on health or the above considerations have been reported for the low-energy power frequency fields (World Health Organization [WHO] 2007a). Effects associated with ungrounded, metallic objects and static charge accumulation and discharge in dairy facilities have been found when the connections from a distribution line meter have not been properly installed on the farm side of a distribution circuit.

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

The consensus of scientific panels reviewing this research is that the evidence does not support a cause-and-effect relationship between EMF and any adverse health outcomes (e.g., American Medical Association [AMA] 1994; National Research Council 1997; National Institute of Environmental Health Sciences [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 review of this topic by the WHO (International Association for Research on Cancer 2002) concluded that this association is very weak, and there is inadequate evidence to support any other type of excess cancer risk associated with exposure to EMF.

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

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

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

Although no federal standards exist for maximum EMF strengths for transmission lines, two states (New York and Florida) have promulgated EMF regulations. Florida's regulation is the more restrictive of the two, with field levels being limited to 150 milligauss (mG) at the edge of the ROW for lines of 230-kV and less. The expected magnetic field strengths at the edge of the proposed ROW would fall well within these standards.

4.16.1.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, no new EMFs would be created from the proposed upgrading of the transmission lines; therefore, there would be no impacts to the environment.

Action Alternative
Magnetic fields would continue be produced along the length of the existing 161-kV transmission lines and new magnetic fields would be produced along the length of the reenergized 500-kV lines. The proposed transmission line upgrades would allow the subject line to carry higher current levels as system conditions require. The strength of the magnetic fields within and near the ROW would vary with the electric load on the line as well as with the terrain. Because line voltages would not change, there would be no increase in electric field strength. Some of the proposed upgrades would result in increased line height above ground during most system conditions, thus reducing the electric field levels. Public exposure to EMF would change over time after the line work is completed as adjacent land uses change. No significant impacts from EMF are anticipated from the upgrade, reenergizing, and operation of the transmission lines.

4.16.2. Lightning Strike Hazard

4.16.2.1. Affected Environment

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

4.16.2.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, no new lighting strike hazards would be created from the proposed upgrading of the transmission lines; therefore, there would be no impacts to the environment.

Action Alternative
Transmission line structures are well grounded, and the conductors are insulated from ground. Therefore, touching a structure supporting a 161-kV transmission line poses no inherent shock hazard. Additionally, TVA transmission lines are built with overhead ground wires that would lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along a line for at least the width of the ROW. The National Electrical Safety Code is strictly followed when installing, repairing, or upgrading TVA

lines or equipment. None of the proposed actions would alter line grounding. Therefore, there would be no additional hazards from lightning strikes.

4.16.3. Noise and Odor

4.16.3.1. Affected Environment

During the proposed upgrade of the transmission lines, equipment would generate noise above ambient levels, for short periods of time. In the more densely populated areas along the ROW, techniques would be used to limit noise as much as possible. In residential areas, the need for periodic ROW vegetation maintenance, i.e., mowing, would be limited or nonexistent.

4.16.3.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, no new noise and odors would be created from the proposed upgrading of the transmission lines; therefore, there would be no impacts to the environment.

Action Alternative

Because of the general lack of nearby sensitive receptors and the short work period, noise-related effects are expected to be temporary and insignificant. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. Upgrading, reenergizing, and operating the lines are not expected to produce any noticeable odors.

Additionally, no significant long-term impacts related to noise are expected as a result of the operation of the transmission lines. None of the proposed upgrades would result in any increase in the potential for noise produced by the lines.

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CHAPTER 5

5.0 OTHER EFFECTS

5.1. Unavoidable Adverse Environmental Impacts

This section describes principal unavoidable adverse environmental impacts for which mitigation measures are either considered impractical, do not exist, or cannot entirely eliminate the impact. Specifically, this section considers unavoidable adverse impacts that would occur for either of the Action Alternatives, i.e., completing and operating one partially completed B&W reactor or constructing and operating one Westinghouse AP1000 reactor at the BLN site, in addition to maintaining and operating associated transmission facilities. These unavoidable construction and operational effects are identified in Table 5-1.

Table 5-1. Construction- and Operation-Related Unavoidable Adverse Environmental Impacts

Issue Construction	Unavoidable Adverse Impact
Land Use	The BLN site is approximately 1600 acres in total. Approximately 400 acres of the 1600-acre BLN site were previously disturbed for the partially constructed BLN 1&2 and associated plant structures. Completion of a B&W unit would require reclearing and grading of previously disturbed ground. Construction of an AP1000 unit and associated structures is expected to require clearing and blasting of about 50 acres of forested land, and reclearing and grading of previously disturbed ground. There would be a long-term commitment of land for the existing transmission corridors. Potential for unanticipated disturbances to historic, cultural, or paleontological resources is mostly or entirely mitigated. Some land would be dedicated to long-term disposal of construction debris and not available for other uses.
Hydrologic & Water Use	A small amount of water is consumed during construction activities. Ground-disturbing activities along river banks or stream banks (in the case of the transmission line maintenance), on a short-term basis, introduce minor amounts of sediments and potentially chemicals into water bodies.
Aquatic Ecology	Construction at river's edge may cause direct, short-term, and minor loss of some organisms and temporary degradation of habitat. Existing transmission lines that cross streams may continue to cause minor disruption of some organisms and degradation of habitat.
Terrestrial Ecology	Operation of a BLN unit and transmission corridor would continue minor alterations to habitat and the suite of species which inhabit them. Construction, clearing, and grading of the BLN site could directly harm or displace a few animals. Construction noises may startle or scare animals. These minor impacts are intermittent and would continue throughout the construction phase.
Socioeconomics and Environmental Justice	Construction workers and local residents would be exposed to elevated levels of traffic through the course of the construction phase. The influx of construction workforce would cause short-term, minor effects on local housing, infrastructure, land use, and community services such as fire or police protection. In the short-term, there may be school crowding. Increased tax revenue would mitigate much of this impact. Construction workers and local residents would be exposed to elevated levels of dust, exhaust emissions, and noise from construction and equipment. These constitute minor unavoidable impacts. No unavoidable adverse construction impacts to minority populations are anticipated.

Issue Operational	Unavoidable Adverse Impact
Land Use	The commitment of land use described above would continue over the operational life of this project. Some of the land would be returned to its former state following the end of construction. The Uranium Fuel Cycle of a BLN unit would increase radioactive and nonradioactive wastes that would require land to be dedicated for the long-term disposal of hazardous and nonhazardous materials in permitted disposal facilities or permitted landfills. This land would not be available for most other uses. The viewscape of the BLN site and transmission facilities would continue to be impacted over the operational period, but no more so than at the present.
Hydrologic & Water Use	Normal plant operations result in discharge of small amounts of chemicals and radioactive effluents to Guntersville Reservoir throughout the life of a BLN unit. Compliance with the NPDES permit; applicable water quality standards; storm water pollution prevention (SWPPP) and SPCC plans; and discharge of radioactive effluents in compliance with applicable regulatory standards would ensure that the result would be little or no unavoidable adverse impacts. Discharge of cooling water results in a thermal plume in Guntersville Reservoir throughout the operational life of a BLN unit. The differences between plume temperature and ambient water temperature are maintained within limits set in the NPDES permit. Cooling towers mitigate much of the heat that would otherwise be discharged to the reservoir. Use of closed-cycle cooling would result in only minor adverse impacts. Water lost to evaporation represents consumption of water that would not be available for other uses. The maximum consumptive use of surface water, which would continue throughout the operational life of the plant, is less than 1 percent of 7Q10.
Aquatic Ecology	The effects of entrainment or impingement result in a loss of fish and other aquatic species. Because a closed-loop cooling system that substantively reduces the loss of fish and aquatic species is used, the impacts of entrainment or impingement on aquatic species would be minor and insignificant. Routine maintenance activities may result in rare episodic chemical or petroleum spills near water that could, in turn, affect aquatic life. Preparation and adherence to the SPCC plan would avoid/minimize contamination from any such spills. Although within NPDES permit limits, discharge of small amounts of chemicals to Guntersville Reservoir from outine plant operations could result in minor insignificant effects on aquatic life over the operational life of this project.
Terrestrial Ecology	Birds may periodically collide with the cooling towers or the existing transmission lines. Such occurrences are anticipated to be minor. Some minor clearing, maintenance, and upgrading of transmission lines could result in short-term disruption of wildlife, but no long-term changes would be expected from existing habitat conditions. Periodic noise, such as maintenance at the site or along the existing transmission line, may cause temporary and minor impacts to nearby wildlife over the operational life of this project.
Socioeconomics and Environmental Justice	Minor unavoidable adverse impacts are expected over the life of operating a unit at BLN. The transmission lines are built in accordance with applicable regulations and codes to minimize the risk of electric shock. However, over the life of the plant, the transmission line has the potential to produce electric shock to people working near the line or from fallen lines. Operation and outages of a BLN unit would increase traffic on local roads during shift change. Although emissions would be maintained within limits established in permits, air emissions from diesel generators and equipment, and vehicles would have a minor impact on workers and local residents over the operational life of this project. Unavoidable adverse operational impacts to minority populations are not expected to occur.

Issue – Operational (continued)	Unavoidable Adverse Impact
Radiological	Small radiological doses to workers and members of the public from releases to air and surface water would occur over the operational life of this project. Releases are well below regulatory limits. Effluents are treated according to applicable regulatory standards before being discharged into Guntersville Reservoir. While employees are potentially exposed over the long term, adherence to applicable regulatory standards, radiological safety procedures, work plans and safety measures reduce this exposure to a negligible impact. High-level radioactive spent fuel is stored and isolated from the biosphere for thousands of years. The impacts of high-level radioactive waste and spent fuel are reduced through specific plant design features in conjunction with a waste minimization program. Impacts are further reduced through employee safety training programs and work procedures, and by strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste in a geological repository, or reprocessing. The mitigation measures reduce the risk of radioactive impacts, but there is still some residual risk. Waste disposal constitutes a commitment of land that continues for thousands of years into the future. Low-level radioactive and nonradioactive waste would be stored, treated, and disposed. Disposal of these materials represents a commitment of land for hundreds or thousands of years. The impacts of low-level radioactive and nonradioactive hazardous waste are reduced through waste minimization programs, employee training programs, and strict adherence to work procedures and applicable regulations.
Atmospheric & Meteorological	Diesel generators and equipment would contribute to minor air emissions over the course of this project. Burning of any material associated with maintaining transmission line rights-of way would contribute to short-term air pollution. As described in Chapter 3, minor radioactive emissions would occur from the proposed unit during normal operations. Compliance with permit limits and regulations for installing and operating air emission sources and monitoring of those air emissions would result in little or no adverse impacts. Cooling towers would emit a plume of water vapor resulting in a limited obstructed view of the sky, causing a shadowing effect on the ground that has a small effect on vegetation. The plumes present little environmental effect on humans or biota.

5.2. Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment

One of NEPA's basic EIS requirements is to describe "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Unavoidable adverse impacts of construction and operation are discussed in Section 5.1, and the irreversible and irretrievable commitments of resources are discussed in Section 5.3. This section focuses on and compares the significant short-term benefit (e.g., principally generation of electricity) and uses of environmental resources which have long-term consequences on environmental productivity. Table 5-2 summarizes the proposed action's short-term uses and benefits versus the long-term consequences on environmental productivity. For the purposes of this section, the term "short term" represents the period from start of construction to end of plant life, including prompt decommissioning. In contrast, the term "long-term" represents the period extending beyond the end of plant life, including the period up to and beyond that required for delayed plant decommissioning. This discussion applies to the general ramifications of implementing either Action Alternative.

The short-term beneficial impacts of usage outweigh the adverse impacts on long-term environmental productivity. The principal short-term benefit from a BLN unit would be the production of a relatively clean and stable form of electrical energy. With respect to long-term benefits, nuclear energy avoids carbon dioxide emissions that may have a significant long-term detrimental effect on global climate. Nuclear energy also reduces the depletion of fossil fuels. Chapter 3 describes effects associated with uranium fuel use. These impacts include radioactive waste, spent fuel storage, and transportation of radioactive materials. Subsection 5.2.2 and Section 5.3 describe the effects of mining and in-situ leaching, conversion, enrichment of uranium, fabrication of nuclear fuel, use of fuel, and disposal of the spent fuel.

There are two key long-term adverse impacts on productivity. Both of these environmental liabilities are governed by the half-lives of the respective radioisotopes. The first involves long-term radioactive contamination of the reactor vessel, equipment, and other material that are exposed to radioactive isotopes. The second involves irradiated fuel and high-level waste that must be safeguarded and isolated from the biosphere for thousands of years, or reprocessed for use as fuel.

5.2.1. Short-Term Uses and Benefits

There are a number of short-term benefits that are derived from construction and operation of a single nuclear generating unit at BLN. These short-term uses and benefits, as summarized below include the following:

- Electricity generation
- Fuel diversity
- Avoidance of air pollution and greenhouse gas emissions
- Land use
- Aquatic and terrestrial biota
- Socioeconomic changes and growth

As described in Chapter 1, the principal short-term benefit of a BLN unit would be the generation of electricity to meet the growing demand for electricity in TVA's power service area. Energy diversity is also an element fundamental to the objective of achieving a reliable and affordable electrical power supply system. Over-reliance on any one fuel source leaves consumers vulnerable to price spikes and supply disruptions. A BLN unit furthers the goal of creating new nuclear base load generating capacity. Operation of a reactor at BLN also advances the Congressional goal of obtaining a diversified mix of electrical generating sources. Upgrading the existing transmission lines would increase the short-term and long-term capacity and reliability of the power supply in TVA's service area.

Natural gas, and in particular, coal-fired electricity generating plants produce substantive amounts of air pollutant emissions. Fossil fuel air emissions, particularly carbon dioxide, are believed by many in the scientific community to contribute to the greenhouse effect and, consequently, global climate change. Beyond steam and water vapor, modern nuclear reactors produce virtually no air emissions during operation, and only very minor levels of radioactive emissions. The generation of significant air emissions is avoided by foregoing construction of a comparably sized coal- or gas-fired alternative, and instead constructing or completing a single unit at BLN. Even with contributions from the UFC, the net benefits of reduced emissions from nuclear over those of natural gas or coal-fired facilities are substantive.

Table 5-2. Summary of the Proposed Action's Principal Short-Term Benefits Versus the Long-Term Impacts on Productivity

Issue	Short-Term Uses and Benefits	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Land Use	Continued commitment of land use at the existing site. Some potential loss in agricultural productivity, or natural habitats and woodlands.	No long-term loss as the land could be released for other uses or returned to its natural state after the reactor is decommissioned.
Terrestrial and Aquatic Ecology	Disrupts or destroys some flora and fauna on and near the BLN site, and along the transmission corridor. No significant effect to species or habitats is expected to occur. After construction, some flora and fauna may recover in areas that are no longer affected by construction or plant operations.	No significant long-term detrimental disturbance to biota or their habitats.
Socioeconomic Growth	Injection of tax revenues, plant expenditures, and employee spending contributes to the growth of the local economy. In the short term, this growth may strain local infrastructure and services.	Tax revenues, plant expenditures, and employee spending leads to some long-term direct and secondary growth in the local economy, infrastructure, and services that may continue after the reactors are decommissioned.
Irradiated Spent Fuel	Provides a short-term supply of relatively clean energy.	Managed as a High-Level Radioactive Waste, and either reprocessed or isolated from the biosphere for thousands or tens of thousands of years. Long-term commitment of the local storage area and the underground geological repository.
Other Radioactive Waste	The radioactively contaminated reactor vessel and equipment are required for the short term production of nuclear energy.	Contaminated waste must be managed and isolated from the biosphere for hundreds or thousands of years.
Potential for Accident	Potential security consequences of a reactor accident could range from small to large. However, the probability or likelihood of a severe accident is deemed to be very remote. Because the probability or likelihood of such an event is so small, the overall risk of a nuclear accident is, likewise, considered to be so small as not to constitute a potentially significant impact upon the human environment.	In the advent of an accident, the impacts could be long-term and substantial.

Issue	Short-Term Uses and Benefits	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Depletion of Uranium	As a reactor fuel, the uranium provides a short-term supply of relatively clean energy.	Construction and operation of a BLN unit contributes to the long-term cumulative depletion of the global uranium supply.
Offset Usage of Finite Fossil Fuel Supplies	During operation, a BLN unit avoids the consumption of fossil fuels, albeit with some increase in the use of uranium. Consumption of fossil fuels in the UFC is substantively less than would occur for equivalently sized fossil fuel based generation.	Reduces the cumulative long-term depletion of global fossil fuel supplies.
Materials, Energy, and Water	In the short term, the energy used in operating the reactors results in far more electrical power generation than was used in their construction. The use of materials in constructing the BLN is also critical to the goal of producing a clean and reliable supply of electrical power. A relatively modest quantity of cooling water is lost through evaporation and drift.	Construction and operation of a BLN unit contributes to the cumulative long-term irretrievable use of materials, energy, and water used in the construction and operation of the reactors. However, the reactor provides far more energy than is consumed in its construction.
Air Pollution	Operation of a BLN unit avoids air pollutants that would likely be produced by fossil fuel plants if the reactor was not constructed.	Operation of the unit results in a long-term cumulative avoidance of greenhouse emissions that would likely be produced by fossil fuel plants if the unit were not constructed.
Social Changes	The project stimulates economic growth and productivity in the local area. In the short-term, however, this growth may strain local infrastructure and services, resulting in problems such as overcrowding of schools and traffic congestion. However, revenue derived from this project may fund increased infrastructure and social services.	Payments made in lieu of taxes by TVA, and wages spent by the operational staff may inject significant revenues into the local economy that have long-lasting economic growth and development effects, which may continue after a BLN unit is decommissioned. Socioeconomic changes such as transformation in the nature and character of the community likely continue long after a BLN unit has been decommissioned.

The construction and operation of a single unit at the BLN site would result in the continued commitment of land use at the existing site, as well as for the transmission corridor (i.e., there are not "new" long-term effects on land use within the existing rights-of-way). Land required for the corridor results in the continued loss of some agricultural or pastureland from transmission structures, or undeveloped habitats and woodlands. In the short term, the project results in some potential loss in agricultural productivity, or natural habitats and woodlands. However, this loss does not represent a long-term loss, as the land may be released for other uses or returned to its natural state after the BLN unit has been decommissioned. Construction and operation of a single unit at the BLN site also disrupts or destroys some flora and fauna on and near the site, as does maintenance along the transmission corridor. However, no significant effect to species or habitats is expected to occur. After construction is completed, some flora and fauna may recover in areas that are no longer affected by construction or plant operations.

Construction of a BLN unit is expected to stimulate economic growth and productivity in the local area. Wages spent by workers are expected to provide an economic boost locally and regionally. The construction and operation of a BLN Unit may also spur indirect or secondary socioeconomic growth. In the short-term, however, this growth may strain some local infrastructure and services, resulting in problems such as overcrowding of schools and increased traffic. However, tax revenue derived from this project may fund increased infrastructure and social services. TVA payments made in lieu taxes and wages spent by the operations staff would inject revenue into the local economy that may have long-lasting economic growth and developmental effects. In the long-term, some of this growth may continue even after the unit has been decommissioned. Socioeconomic changes brought about by the operation of the unit may also continue long after the plant has been decommissioned. This increased growth leads to long-term changes in the nature and character of the community that some may regard to be adverse.

5.2.2. Maintenance and Enhancement of Long-Term Environmental Productivity

Potential long-term effects on the productivity of the human environment are described below and summarized in Table 5-2. The assessment of long-term productivity impacts does not include the short-term effects related to construction and operation of a BLN unit.

Some of the adverse environmental impacts may remain after practical measures to avoid or mitigate them have been taken. As described in Chapter 1, the BLN site was originally designated for construction of nuclear reactors; therefore, siting and operating a single nuclear unit there represents a continuation of the originally planned land use of the site. After the reactor is shutdown, and the BLN unit is decommissioned to NRC standards, this land would be available for other industrial or nonindustrial uses. Therefore, land use impacts are not expected to constitute a long-term productivity issue. Similarly, impacts such as air emission, water effluents, and other impacts described in Chapter 3, but not specifically mentioned in this section are insignificant.

Exposure to Hazardous and Radioactive Materials and Waste

Workers may be exposed to low doses of radiation and trace amounts of hazardous materials and waste. Workplace exposures are carefully monitored to ensure that radioactive exposure is within regulatory limits. Local nonworkers also receive a very small incremental dose of radiation. Radiological monitoring and impacts related to operation of a BLN unit are described in Chapter 3. The persistence of radionuclides depends on the half-life of the radionuclides. The doses are in compliance with applicable regulatory standards and permits and do not significantly affect humans, biota, or air or water resources.

Radiological emissions are not expected to contaminate BLN property or the surrounding land. Once the plant ceases to operate and is decommissioned, radiological releases also cease. No future issues associated with the radiological emissions from operation of a nuclear unit are expected to affect the long-term uses of the BLN site.

Potential for Nuclear Accident
The risk of a potential accident is the product of the potential consequences, and the probability or likelihood that an event occurs. The potential consequences of an accident could range between small to large. However, the probability or likelihood of a major accident is very remote. Because the probability or likelihood of such an event is so small, the overall risk of a nuclear accident is likewise so small as not to constitute a potentially significant impact upon the human environment. The results of TVA's analysis in Section 3.19 indicate that the environmental risks due to postulated accidents are exceedingly minor.

Uranium Fuel Cycle and Depletion of Uranium
The principal use of uranium is as a fuel for nuclear power plants. With approximately 440 nuclear reactors operating worldwide, these plants currently produce approximately 16 percent of the world's electrical power generation. Global uranium fuel consumption is increasing as nuclear power generation continues to expand worldwide. A BLN unit would contribute to a small incremental increase in the depletion of uranium. The World Nuclear Association studies uranium supply and demand issues, and states that there is currently a 50-year supply of relatively low-cost uranium. Higher prices are expected to induce increased uranium exploration and production. A doubling in market price from the 2003 level might increase the supply of this resource tenfold. The introduction of fast breeder reactors and other technologies could further reduce the gap between supply and demand.

Offset Usage of Finite Fossil Fuel Supplies
Fossil fuels represent a finite geological deposit, the use of which constitutes a cumulative irreversible commitment of a natural energy resource. The construction and operation of a BLN unit helps offset the cumulative depletion of this limited resource.

Use of Materials, Energy, and Water
Construction and operation of a BLN unit result in the long-term, irreversible use of materials and energy for the construction and operation of the reactors. However, in the short-term, the reactors provide far more energy than is consumed in their construction. A small amount of water is consumed in the construction of a BLN unit. A relatively modest quantity of cooling water is also consumed as loss to the atmosphere through evaporation and drift.

5.3. Irreversible and Irretrievable Commitments of Resources

This section describes anticipated Irreversible and Irretrievable (I&I) commitments of environmental resources that would occur in either the construction and operation of an AP1000 advanced passive reactor, or the completion and operation of a partially completed B&W reactor at the BLN site. The I&I commitments are summarized in Table 5-3 below.

For the purposes of this analysis, the term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

Table 5-3. Summary of Irreversible and Irretrievable Commitment of Environmental Resources

Environmental and Material Resource Issues	Irreversible	Irretrievable
Socioeconomic Changes	The project results in both short-term and long-term changes in the population and nature and character of the local community, and the local socioeconomic structure. Some impacts on infrastructure and services are temporary, while other changes represent a permanent and irreversible change in socioeconomic infrastructure.	None
Disposal of Hazardous and Radioactively Contaminated Waste	The generation of radioactive, hazardous, and nonhazardous waste that needs to be disposed. Land committed to the disposal of radioactive and nonradioactive wastes is an irreversible impact because it is committed to that use, and is largely unavailable for other purposes.	None
Commitment of Underground Geological Resources for Disposal of Radioactive Spent Fuel	High-level waste and spent nuclear fuel is isolated from the biosphere for thousands or tens of thousands of years in a deep underground geological repository. This long-term commitment makes the surrounding geological resources unusable for thousands or tens of thousands of years.	None
Destruction of Geological Resources During Uranium Mining and Fuel Cycle	None	Uranium mining can result in contamination and destruction of geological resources, and pollution of lakes, streams, underground aquifers, and the soil.
Contaminated and Irradiated Materials	None	Some of the materials used in the construction of a BLN unit are contaminated or irradiated over the life of the plant. Much of this material is not reused or recycled, and must be isolated from the biosphere for hundreds or thousands of years.
Land Use	None	The range of available land uses for the BLN site and existing transmission line ROW are now restricted for the life of the project and transmission lines, resulting in irretrievable lost production or use of renewable resources such as timber, agricultural land, or wildlife habitat during the period the land is used.

Environmental and Material Resource Issues	Irreversible	Irretrievable
Water Consumption	None	Relatively small amounts of potable water are used during construction and operation of a BLN unit. A small fraction of the cooling water taken from Guntersville Reservoir is lost through evaporation. The impact to surface water resources is relatively small, but represents a natural resource that is no longer readily available for use.
Consumption of Energy	None	Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity is consumed in construction and to a lesser extent, operation of the BLN.
Consumption of Uranium Fuel	None	A BLN reactor would contribute a relatively small increase in the depletion of uranium that is used to fuel the reactors.

5.3.1. Irreversible Environmental Commitments

Irreversible environmental commitments resulting from the BLN project would relate primarily to those of the UFC: (1) land disposal of equipment and materials contaminated by hazardous and low-level radioactive waste and (2) UFC effects that include commitment of underground geological resources for disposal of high-level radioactive waste and spent fuel, and destruction of geological resources during uranium mining. Implementation of either Action Alternative would also result in both short-term and long-term minor changes in the population, the nature, and character of the local community, and the local socioeconomic infrastructure. Once the unit ceases operations, and the nuclear plant is decontaminated and decommissioned in accordance with NRC requirements, the land that supports the facility may be returned to other industrial or nonindustrial uses. However, the land may continue to be committed to use for other future electrical projects or other purposes.

Uranium Fuel Cycle

The UFC is defined as the total of those options and processes associated with the provision, utilization, and ultimate disposition of fuel for nuclear power reactors. Environmental effects are contributed from uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, use of the fuel, possible future reprocessing of irradiated fuel, transportation of radioactive materials, disposal of used (spent) fuel and management of low-level and high-level wastes.

The BLN unit would generate radioactive, hazardous, and nonhazardous wastes that require disposal. This waste is disposed of in permitted hazardous, mixed, or radioactive landfills or disposal facilities. Land committed to the disposal of radioactive and hazardous wastes represents an irreversible impact because it is committed to that use, and can be used for few other purposes.

Table 5.7-2 in the COLA ER (TVA 2008a) presents environmental data on the UFC. The UFC effects noted in Table 5.7-2 as permanent or comprising emissions for fuel production or storage of spent fuel would be considered irreversible. That ER analysis, which is herein incorporated by reference, described the UFC environmental effects from both a single 1,000-MW nuclear power reactor and two 1,150-MWe units operating at the BLN site. As described in the ER, the approach taken by NRC in estimating effects was intended to ensure that the actual environmental effects were less than the quantities shown for the 1,000 MWe reference plant and to envelope the widest range of operating conditions for light water reactors. That analysis concluded all resource impacts were small (i.e., not detectable or are so minor that they neither destabilize nor noticeably alter any important attribute of the resource). The effects from either of the current Action Alternatives for completing or constructing and operating a single 1,100 MWe unit at the BLN site are bounded by that analysis. As such, impacts would be even less than the two-unit analysis, which concluded only small effects.

5.3.2. Irretrievable Environmental Commitments

Irretrievable environmental commitments resulting from a BLN unit include the following:

- Construction and irradiated materials
- Water consumption
- Consumption of energy
- Consumption of uranium fuel
- Land Use
- Destruction of geological resources during uranium mining and fuel cycle

Construction and Irradiated Materials

Common irretrievable commitments of materials used either for completion of a partially completed B&W reactor (BLN Unit 1 or Unit 2) or construction of an AP1000 reactor include concrete, rebar, structural steel, power cable, small bore piping and large bore piping. A portion of these materials used in the construction of either type of reactor become contaminated or irradiated over the life of BLN operation. Much of this material cannot be reused or recycled, and must be isolated from the biosphere for hundreds or thousands of years. However, because some of this material may be reused (if uncontaminated) or decontaminated for future use, the recycled portion does not constitute an irretrievable commitment of resources. The estimated quantities of materials needed to construct an AP1000 reactor at BLN are concrete (77, 200 cu. yds.), rebar (10,000 T.), structural steel (6,400 T.), power cable(810,000 linear ft.), small bore piping (230,000 linear ft.) and large bore piping (68,000 linear ft.). Because the B&W units are partially complete, proportionally smaller amounts of materials would be needed to complete one of them compared to an AP1000 unit. Additionally, smaller amounts of materials would be required to complete Unit 1 than to complete Unit 2.

While the amount of construction materials is large, use of such quantities in large-scale construction projects such as nuclear reactors, hydroelectric and coal-fired plants, and many large industrial facilities (e.g., refineries and manufacturing plants) represents a relatively small incremental increase in the overall use of such materials. Even if this material is eventually disposed of, use of construction materials in such quantities has a small impact with respect to the national or global consumption of these materials. An additional irretrievable commitment of resources includes materials used during normal plant operations, some of which are recovered or recycled.

Irreversible commitments of resources generally occur through the use of nonrenewable resources that have few or no alternative uses at the termination of the proposed action. Transmission line reconductoring and upgrades also would require the irretrievable 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 irretrievably committed, while the metals used in conductors, supporting structures, and other equipment could be and would likely be recycled. The useful life of the transmission structures is expected to be at least 60 years.

Water Consumption

Relatively small amounts of potable water are used during construction and operation of a BLN unit. Some of the cooling water taken from Guntersville Reservoir is lost through the cooling towers by way of drift and evaporation. The impact to surface water resources is relatively small, but represents a natural resource that may no longer be available for use. However, as part of the natural hydrologic cycle, this water is eventually recycled through the ecosystem.

Consumption of Energy Used in Constructing the Reactors

Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity are consumed in construction and, to a much smaller extent, in the operation of a BLN unit. Beyond ancillary (e.g., vehicles, equipment) usage, nuclear reactors do not consume fossil fuels such as petroleum or coal.

The total amount of energy consumed during construction or operation of a BLN unit is very small in comparison to the total amount consumed within the United States. On net balance, the reactor produces far more energy (as measured in British Thermal Units) than is consumed in its construction and operation. For this reason, one of the key considerations related to the I&I requirement is that operation of a BLN unit helps conserve or helps avoid the consumption of finite fossil fuel supplies.

Uranium Fuel Cycle and Depletion of Uranium

The principal use of uranium is as a fuel for nuclear power plants. With approximately 440 nuclear reactors operating worldwide, these plants currently produce approximately 16 percent of the world's electrical power generation. Global uranium fuel consumption is increasing, as nuclear power generation continues to expand worldwide. A BLN reactor would contribute a relatively small increase in the depletion of uranium. Sources of uranium include primary mine production as well as secondary sources. Nuclear reactor uranium consumption now exceeds the supplies produced through mining. The resulting shortfall has been covered by several secondary sources including excess inventories held by producers, utilities, other fuel cycle participants, reprocessed reactor fuel, and uranium derived from dismantling Russian nuclear weapons.

The limited availability of uranium fuel may affect the future expansion of nuclear power. DOE uranium estimates indicate that sufficient resources exist in the United States to fuel all operating reactors and reactors being planned for the next 10 years at a U3O8 cost (1996 dollars) of $30.00/lb or less. The resource categories designated as reserves and estimated additional resources can supply these quantities of uranium.

The World Nuclear Association studies supply and demand for uranium and states that the world's present measured resources of uranium, in the cost category somewhat above present spot prices and used only in conventional reactors, at current rates of consumption, are sufficient to last for some 70 years. Very little uranium exploration occurred between 1985 and 2005, so the significant increase in exploration that is currently being witnessed might double the known economic reserves. On the basis of analogies with other metal minerals, a doubling in price from present levels could be expected to create about a tenfold increase in measured resources over time. The introduction of fast breeder reactors and other technologies may also reduce the supply-demand gap. The addition of a BLN unit increases consumption of uranium in the United States by approximately 2 percent and increases worldwide consumption of uranium by about 0.5 percent. Thus, the addition of BLN by itself does not create a significant impact on uranium resources.

5.4. Energy Resources and Conservation Potential

The total amount of energy consumed during construction or operation of the BLN is very small in comparison to the total amount consumed within the United States. On net balance, the reactor would produce far more energy (as measured in British Thermal Units) than would be consumed in its construction and operation. For this reason, one of the key considerations related to the I&I requirement is that operation of a BLN unit helps conserve or helps avoid the consumption of finite fossil fuels supplies.

Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity would, however, be consumed in construction and, to a much smaller extent, in the operation of any of the Action Alternatives for the BLN site. An AP1000 reactor would require more off-site fabrication of components, transport of components, and on-site construction, and therefore more energy to build, than completing either the partially built BLN Unit 1 or Unit 2. Because the existing Unit 1 is more complete than Unit 2, of the two units, Unit 1 would require less energy to build.

Beyond ancillary (e.g., vehicles, equipment) usage and that required to support the UFC, nuclear reactors do not consume fossil fuels such as petroleum or coal during operation. Processing of nuclear fuel is, however, an energy-intensive activity. Existing uranium enrichment facilities are large and each facility services several nuclear generating plants. For comparative purposes, the energy required to process or enrich uranium using gaseous diffusion sufficient to fuel a single 1000-MW pressurized boiling water reactor nuclear plant (slightly smaller than the Action Alternatives for a single BLN unit) would be approximately that of the output from a 50-MW fossil-fueled (coal-fired) facility operating at 75 percent capacity factor. Newer technologies (e.g., centrifuge or atomic vapor laser isotope separation) currently, or becoming, commercially available for enrichment, utilize only 4-15 percent as much power as this gaseous diffusion example. As it is anticipated that these new, less energy intensive technologies will eventually become the norm for production of nuclear fuel, the processing portion of the UFC would likely use even less energy and become even more "carbon-friendly" in the future. The DOE has also released the Draft Programmatic EIS for the Global Nuclear Energy Partnership (GNEP) (DOE 2008) with the identified preferred alternative of implementing a "closed" cycle for nuclear fuel management in the United States (i.e., select among nuclear fuel reprocessing alternatives). If selected and implemented by DOE, this approach for GNEP could both expand the availability of nuclear fuel and potentially stabilize or reduce the worldwide GHG releases associated with mining and milling of uranium as a fuel source.

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CHAPTER 6

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CHAPTER 7

7.0 DISTRIBUTION OF FSEIS

7.1. List of Agencies, Organizations, and Persons to Whom Copies of the FSEIS Were Sent and to Whom an E-Link was Provided

Following is a list of agencies, organization, officials, libraries and individuals to whom either published copies (bound or compact disc [CD]) of the FSEIS were provided, or Web links to an active TVA web site from which the document can be accessed were sent. Those names with an asterix (*) received copies of both the FSEIS and DSEIS.

Federal Agencies Receiving the FSEIS (Hard Copy or CD)

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Natural Resources Conservation Service, Georgia State Conservationist*
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U.S. Department of the Interior*
U.S. Environmental Protection Agency*
U.S. Fish and Wildlife Service, Cookeville Field Office*
U.S. Fish and Wildlife Service, Daphne Field Office*
U.S. Fish and Wildlife Service, Refuge Office*
U.S. Fish and Wildlife Service, Southeast Region Office*
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U.S. Nuclear Regulatory Commission*
National Park Service, Chickamauga-Chattanooga National Military Park National Park Service, Southeast Region Office*

State Agencies Receiving the FSEIS (Hard Copy or CD)

Alabama
Alabama Department of Conservation and Natural Resources*
Alabama Department of Environmental Management*
Alabama Department of Environmental Economic and Community Affairs*
Alabama Historical Commission*
North-Central Alabama Regional Council of Governments*
Top of Alabama Regional Council of Governments*

Georgia
Economic Development Administration*
Georgia Department of Natural Resources, Environmental Protection Division*
Georgia Department of Natural Resources, Historic Preservation Division*
Georgia Department of Natural Resources, Wildlife Resources Division*
Georgia State Clearing House*

Tennessee
Southeast Tennessee Development District*
South Central Tennessee Development District*
Tennessee Department of Economic and Community Development*
Tennessee Department of Environment and Conservation, Division of Air Pollution Control*

Tennessee Department of Environment and Conservation, Division of Ground Water Protection*
Tennessee Department of Environment and Conservation, Division of Water Supply*
Tennessee Department of Environment and Conservation, Resource Management Division*
Tennessee Historical Commission*
Tennessee Wildlife Resources Agency*

Federally Recognized Tribes (E-mail notification of availability)

Eastern Band of Cherokee Indians*
United Keetoowah Band of Cherokee Indians in Oklahoma*
Cherokee Nation*
Chickasaw Nation*
Muscogee (Creek) Nation of Oklahoma*
Thlopthlocco Tribal Town*
Kialegee Tribal Town*
Alabama-Quassarte Tribal Town*
Alabama-Coushatta Tribe of Texas*
Eastern Shawnee Tribe of Oklahoma*
Shawnee Tribe*
Absentee Shawnee Tribe of Oklahoma*
Seminole Tribe of Florida*
Jena Band of Choctaw Indians*
Poarch Band of Creek Indians*

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Scottsboro, Alabama

Therrel Jones
Scottsboro, Alabama

Frances Lamberts
Jonesborough, Tennessee

Jack Livingston
Scottsboro, Alabama

Ross McCluney
Chattanooga, Tennessee

Robert McMaster
Marietta, Georgia

Mike Paris
Hollywood, Alabama

The Honorable Melton Potter
Mayor of Scottsboro
Scottsboro, Alabama

Tereia Sandifer
Dutton, Alabama

Shelia Sheppard
Jackson County EDA
Scottsboro, Alabama

Jimmy R. Spires
Scottsboro, Alabama

Single Nuclear Unit at the Bellefonte Site

Gary Spradlin
Scottsboro, Alabama

David Thornell
Dutton, Alabama

David Trenkle
Huntsville, Alabama

Shonda Wall
Scottsboro, Alabama

Richard Warr
Hollywood City Council
Hollywood, Alabama

Coleman Wilkinson
Scottsboro, Alabama

Tony D. Williams
Meridionville, Alabama

Libraries

Scottsboro Public Library
Scottsboro, Alabama

Stevenson Public Library
Stevenson, Alabama

Lena Cagle Public Library
Bridgeport, Alabama

Huntsville-Madison County Public Library
Huntsville, Alabama

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Rainsville Public Library
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Cecil B. Word Learning Center
Northeast Alabama Community College
Rainsville, Alabama

Beene-Pearson Public Library
South Pittsburg, Tennessee

Chattanooga-Hamilton County Public Library
Chattanooga, Tennessee

7.2. DSEIS Press Release

TVA

NEWS RELEASE

TVA Seeks Comments on Draft Bellefonte Environmental Statement

SCOTTSBORO, Ala. – TVA will hold an open house Tuesday, Dec. 8, in Scottsboro to receive public comments on the environmental review of alternatives for completing and operating a nuclear reactor at the Bellefonte Nuclear Plant site near Hollywood, Ala.

TVA is asking for public comments on three proposed alternatives outlined in a draft supplemental environmental impact statement -- completing one of the existing units, building a new reactor or taking no action.

The environmental review also addresses transmission improvements required to support electric generation at the Bellefonte site. All transmission work would be on existing rights of way.

In 2007, TVA submitted applications to the Nuclear Regulatory Commission for construction and operation of two advanced technology Westinghouse AP1000 reactors at Bellefonte and is currently studying the feasibility of finishing partially constructed units at the site.

The open house will be held from 4 to 8 p.m. at the Goose Pond Civic Center, 876 Ed Hembree Drive in Scottsboro. During the open house, TVA staff will be available to discuss the alternatives and potential environmental impacts of completing and operating a nuclear unit at Bellefonte.

Under provisions of the National Environmental Policy Act, TVA prepared the draft supplemental environmental impact statement using reports previously prepared for the construction of the units, as well as new information.

Along with the detailed engineering and feasibility study, the environmental review will help TVA decide whether to complete one of the existing unfinished units at the plant or construct a new nuclear unit.

The draft supplemental environmental impact statement is available for review and comment online at www.tva.gov/environment/reports/blnp/index.htm. Comments may also be mailed to Ruth Horton, 400 Summit Hill Drive (WT-11D), Knoxville, TN 37902 or faxed to (865) 632-3451. All written comments must be received by Dec.28.

TVA is the nation's largest public power provider and is completely self-financing. TVA provides power to large industries and 158 power distributors that serve

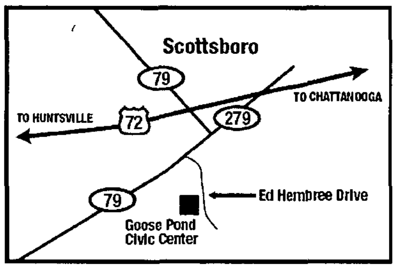
7.3. Information Open House Paid Advertisement

Notice of Public Meeting

TVA

TVA Open House on Bellefonte Nuclear Site Environmental Statement

TVA will hold an open house in Scottsboro, Alabama, to discuss the draft supplemental environmental impact statement (SEIS) for the possible completion of an existing nuclear unit or construction of a new reactor at Bellefonte Nuclear Plant site.



The public is invited to stop by anytime during the open house to provide comments or ask questions about the draft SEIS. Copies of the document will be available at the open house and are also available on the TVA website at the address below.

Three proposed alternatives are outlined in the draft document: completing one of the existing units, building a new reactor, or taking no action. The environmental review also addresses transmission system improvements that would be needed on existing rights of way to support power generation at Bellefonte.

Comments about the draft SEIS can be submitted during the open house or anytime before December 28, 2009. These comments will be considered and addressed in the final SEIS. Any comments received, including names and addresses, will become part of the administrative record and will be available for public inspection.

Along with the detailed engineering and feasibility study currently in progress, this environmental review will help TVA decide if one of the alternatives should be selected to meet the growing base-load power demand.

WHAT: **Public Open House**
DATE: **Tuesday, December 8, 2009**
TIME: **4 p.m. to 8 p.m. CST**
LOCATION: **Goose Pond Civic Center**
876 Ed Hembree Drive, Scottsboro, Alabama

The draft SEIS was made available for public review on November 4, 2009. It can be viewed and comments submitted at www.tva.gov/environment/reports/blnp. Comments may also be submitted by mail, fax, or e-mail to:

Ruth Horton, Senior NEPA Specialist
400 Summit Hill Dr., WT-11D, Knoxville, TN 37902
865-632-3719 Fax: 865-632-3451
blnp@tva.com

If you have special needs, please call Ruth Horton at least five days prior to the open house. You may also e-mail or call her to request a printed copy of the draft SEIS.

Newpapers That Published the Paid Advertisement

Wednesday, December 2, 2009
Chattanooga Times Free Press
Guntersville Advertiser
Huntsville Times

Thursday, December 3, 2009
Rainesville Weekly Post
Scottsboro Daily Sentinel

Friday, December 4, 2009
Chattanooga Hamilton County Herald

Monday, December 7, 2009
Stevenson North Jackson Progress

7.4. Open House Handout

Information Open House
Final Supplemental Environmental Impact Statement
Single Nuclear Unit at the Bellefonte Site
Goose Pond Civic Center, Scottsboro, AL
December 8, 2009

Meeting Purpose

Thank you for attending our information open house. The purpose of this meeting is to provide the opportunity for you to ask questions about the draft supplemental environmental impact statement (SEIS) and to make comments on TVA's analysis of the potential for environmental effects from completing or constructing, and operating a single nuclear unit at the Bellefonte Nuclear Plant (BLN) site in Jackson County, Alabama.

The following information stations are available to visit in the meeting room:

- NEPA Process
- Transmission Upgrades
- Socioeconomics /Air Quality & Meteorology
- Nuclear Plant Operation/Nuclear Plant Safety and Security
- Project Description
- Need for Power
- Water Quality
- Aquatic and Terrestrial Ecology

Under provisions of the National Environmental Policy Act (NEPA), TVA prepared the draft SEIS to supplement and update environmental documents previously prepared for the construction and operation of a nuclear power plant at the Bellefonte site. The TVA Board will use this information along with a detailed engineering and feasibility study currently underway as well as input provided by reviewing agencies and the public to make an informed decision about whether or not to complete an existing nuclear unit or to construct a new reactor. A decision is anticipated in spring 2010.

How to Comment

TVA encourages you to submit comments on the draft SEIS. Please note that to be included in the official project record, comments must be received by TVA during the 45-day comment period that began on November 13, 2009. ***Comments must be received no later than December 28, 2009.***

At today's meeting, comments can be made either orally to the court reporter, in writing on the attached comment form, or on TVA's Web site using one of our laptop computers. Comments can also be submitted at any time during the comment period through TVA's Web site, www.tva.gov/blnp by e-mail at blnp@tva.com, by fax to 865-632-3451, or by U.S. mail to the address below. All comments received, including names and addresses, will become part on the administrative record and will be available for public inspection.

Ruth Horton
TVA NEPA Compliance
400 West Summit Hill Drive (WT-11D)
Knoxville, TN 37902

Using any of these methods, you may also request to be notified of the publication of the Final SEIS on the TVA Web site or to receive a copy of it. The Final SEIS is expected to be available in February 2010.

Proposed Action

TVA proposes to complete or construct, and operate a single approximately 1,100 to 1,200 megawatt (MW) nuclear generating unit at the BLN site. TVA may choose to complete and operate one of the partially constructed Babcock and Wilcox (B&W) pressurized light water reactors, or to construct and operate a new Westinghouse AP1000 advanced pressurized light water reactor (AP1000), or to take no action. Under either of the Action Alternatives, construction activities would incorporate existing facilities and structures and use previously disturbed ground within the BLN site where possible. The existing transmission system would need to be upgraded to prevent overloading while transmitting electricity generated by a new reactor at the BLN site. No new electric transmission lines are proposed.

TVA is making this proposal to meet the need for additional baseload power capacity on the TVA system, maximize the use of existing assets and licensing processes, avoid larger capital expenses by using those existing assets and avoid the environmental impacts of siting and construction new power generating facilities elsewhere. The considerable work that has been accomplished toward licensing the B&W and AP1000 technologies at the BLN site will reduce the time and cost of bringing a single unit on line.

Background

The BLN site is located on a 1,600-acre peninsula on the western shore of Guntersville Reservoir at Tennessee River mile 392, near Hollywood, Alabama.

Construction on the B&W Units 1&2 began in 1974 and continued until 1988 when the Nuclear Regulatory Commission (NRC) granted BLN deferred status. At that time, Unit 1 was approximately 90 percent complete and Unit 2 was approximately 58 percent complete.

BLN Units 1&2 were maintained in deferred status until the project was cancelled and TVA's construction permits were relinquished in 2006. In August 2008, in response to changes in power generation economics, TVA requested reinstatement of the Unit 1&2 construction permits. NRC reinstated the construction permits in March 2009.

Additionally, in 2006 TVA joined NuStart Energy Development, LLC, a consortium consisting of utilities and reactor vendors, with the goal of demonstrating NRC's new combined license application (COLA) process. NuStart chose the BLN site as the demonstration site for the AP1000 technology and TVA submitted a COLA to NRC in October 2007.

TVA forecasts additional baseload generation will be needed in the 2018 to 2020 time frame. Using new nuclear generation will help TVA to meet its goal to have at least 50 percent of its generation portfolio comprised of low- or zero-carbon-emitting sources by the year 2020.

TVA is also currently updating its Integrated Resource Plan (IRP) for future power needs. TVA is proceeding with a decision for new generation at the BLN site because waiting until 2011 for the completion of the IRP before starting evaluation of Bellefonte options could delay availability of baseload generation when needed. Preparing this SEIS for evaluating nuclear options at Bellefonte does not limit the alternatives considered in the IRP.

Fact Sheet

Characteristics		Generation Alternative		
		A – No Action	Alternative B – B&W Unit	Alternative C – AP1000 Unit
Plant Design	Electrical output	Not applicable	At least 1,200 MW	At least 1,100 MW
	Number of fuel assemblies		205	157
	Lifespan		40 years	60 years
	Engineered safety features		Active shutdown and cooling system powered by AC generators.	Passive core cooling system based upon gravity, natural circulation, and compressed gasses.
	Cooling system		Closed-cycle	Closed-cycle
	Ultimate heat sink		Guntersville Reservoir	Atmosphere
Construction	Duration of construction	Not applicable	7.5 years	6.5 years
	Peak on-site workforce		3,015	2,933
	Plant footprint (approximate)	400 acres. Negligible clearing or regrading	400 acres – Minor re-clearing and grading of previously disturbed ground.	585 acres – 185 acres previously undisturbed ground cleared. Minor re-clearing and grading of previously disturbed ground.
	Completion or construction of facilities	No change – routine maintenance.	Activities include: replace steam generators, refurbish or replace instrumentation and various equipment, upgrade barge unloading dock, upgrade cooling tower. No major buildings demolished.	Off-site construction of modules delivered to BLN via barge and completed on site. Several buildings demolished, including turbine building and administration complex.
	Dredging	None	11,100 cubic yards dredged from 1,960 feet of intake channel.	10,000 cubic yards dredged from 1,200 feet of intake channel, and 240 cubic yards from barge unloading dock.
Operation	Typical amount of water withdrawn from Guntersville Reservoir for plant cooling	None withdrawn. Approximately 400,000 gallons per quarter year released.	34,000 gpm[1] withdrawn 22,650 gpm released	23,953 gpm withdrawn 7,914 gpm released
	Number of on-site staff	200	849	650
	Radiological effects of normal operations	None	Doses to the public from discharge of radioactive effluents would be a small fraction of the dose considered safe by the NRC. (10 CFR Part 50, Appendix I)	
	Number of fuel assemblies needed for 40-year operation	None	2,285	1,821
	Number of containers needed for long-term storage of spent fuel	None	96	76
Cost	Construction	Not applicable	\$3,120 – \$3,360/kWe[2]	\$3,300 – \$4,900/kWe
	Operation and maintenance	Not applicable	\$.0132/k5Wh[3]	\$.0126/kWh

[1] gpm = gallons per minute
[2] kWe = kilowatt electric, i.e. cost per unit of power capacity
[3] kWh = kilowatt hour, i.e. cost expressed per unit of power generated

COMMENTS: ____

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Please fold page along dotted line before mailing.

Single Nuclear Unit at the Bellefonte Site Draft SEIS Comment Card

Place Stamp Here

FROM (please print clearly)

Name Mr./Ms./Mrs. ____________________

Organization: ____________________

Address ____________________

City ____________________

State: __________ Zip: __________

Telephone: ____________________

TO: Ruth Horton
TVA NEPA Compliance
400 West Summit Hill Drive
WT 11D-K
Knoxville, TN 37902

Please fold flap along dotted line before mailing and tape.

COMMENTS continued:

I would like to be notified by ☐ e-mail or ☐ U.S. mail (select one) when the FSEIS is available on the TVA website.

E-mail address____

For U.S. mail, please provide your name and address on the front side of this comment card

I would like to receive a printed copy of the FSEIS by U.S. mail.

I would like to receive a copy of the FSEIS on compact disc by U.S. mail.

CHAPTER 8

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GLOSSARY

A-weighted decibel (dBA) - A unit of weighted sound pressure level, measured by the use of a metering characteristic and the "A" weighting specified by American National Standard Institute SI.4-1971(R176). (See decibel).

Accident - One or more unplanned events involving materials that have the potential to endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent adverse health effects.

Accident sequence - With regard to nuclear facilities, an initiating event followed by system failures or operator errors, which can result in significant core damage, confinement system failure, and/or radionuclide releases.

Ambient air - The surrounding atmosphere as it exists around people, plants, and structures. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

Archaeological sites (resources) - Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

Area of potential effects (APE) - Geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. For this SEIS, the archaeological APE is the same as the "Bellefonte Project Area" as identified on the B&W and AP100 site plans.

Artifact - An object produced or shaped by human workmanship of archaeological or historical interest.

As Low as Reasonably Achievable (ALARA) - A concept applied to ensure the quantity of radioactivity released to the environment and the radiation exposure of onsite workers in routine operations, including "anticipated operational occurrences," is maintained as low as reasonably achievable. It takes into account the state of technology, economics of improvements in relation to benefits to public health and safety, and other societal and economic considerations in relation to the use of nuclear energy in the public interest.

Background radiation - Ionizing radiation present in the environment from cosmic rays and natural sources in the Earth; background radiation varies considerably with location.

Baseline - A quantitative expression of conditions, costs, schedule, or technical progress to serve as a base or standard for measurement during the performance of an effort; the established plan against which the status of resources and progress of a project can be measured. For this environmental impact statement, the environmental baseline is the site environmental conditions as they exist or have been estimated to exist in the absence of the proposed action.

Base Load - The minimum amount of electric power or natural gas delivered or required over a given period of time at a steady rate. The minimum continuous load or demand in a power system over a given period of time usually not temperature sensitive.

Base load capacity - The generating equipment normally operated to serve loads on an around-the-clock basis.

Basemat - Reinforced concrete foundation. The AP1000 basemat meets the functional requirements of a building foundation by providing the strength and stability necessary for design loads to transmit safely from the structure onto the underlying rock and soil substrata.

Benthic - Plants and animals dwelling at the bottom of oceans, lakes, rivers, and other surface waters.

Benthic macroinvertebrate - Organisms that are large enough to be seen without the aid of magnification and that live in close association with bottom of flowing and nonflowing bodies of water.

Best management practices (BMP) - A practice or combination or practices that is determined by a state (or other planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with air or water quality goals.

Beta particle - A charged particle emitted from the nucleus of an atom during radioactive decay. A negatively charged beta particle is identical to an electron; a positively charged beta particle is called a "positron."

Beta radiation - Consists of an elementary particle emitted from a nucleus during radioactive decay; it is negatively charged, is identical to an electron, and is easily stopped by a thin sheet of metal.

Block groups - U.S. Bureau of the Census term describing a cluster of blocks generally selected to include 250 to 550 housing units.

Blowdown - A maintenance procedure to remove sediment in power plant components.

Burnup - The total energy released through fission by a given amount of nuclear fuel; generally measured in megawatt-days.

CE-QUAL-W2 - Two-dimensional, laterally averaged, hydrodynamic and water quality model for reservoirs

Cancer - The name given to a group of diseases characterized by uncontrolled cellular growth with cells having invasive characteristics such that the disease can transfer from one organ to another.

Capacity factor - The ratio of the annual average power production of a power plant to its rated capacity.

Canister - A stainless-steel container in which nuclear material is sealed.

Cladding - The metal tube that forms the outer jacket of a nuclear fuel rod or burnable absorber rod. It prevents the release of radioactive material into the coolant. Stainless steel and zirconium alloys *are* common cladding materials.

Consumptive water use - The difference in the volume of water withdrawn from a body of water and the amount released back into the body of water.

Container - With regard to radioactive wastes, the metal envelope in the waste package that provides the primary containment function of the waste package and is designed to meet the containment requirements of 10 CFR Part 60.

Containment structure - A gas-tight shell or other enclosure around a nuclear reactor to confine fission that otherwise might be released to the atmosphere in the event of an accident. Such enclosures are usually dome-shaped and made of steel-reinforced concrete.

Containment design basis - For a nuclear reactor, those bounding conditions for the design of the containment, including temperature, pressure, and leakage rate. Because the containment is provided as an additional barrier to mitigate the consequences of accidents involving the release of radioactive materials, the containment design-basis may include an additional specified margin above those conditions expected to result from the plant design-basis accidents to ensure that the containment design can mitigate unlikely or unforeseen events.

Conductors - A wire or combination of wires not insulated from one another, suitable for carrying electric current.

Cooling water - Water pumped into a nuclear reactor or accelerator to cool components and prevent damage from the intense heat generated when the reactor or accelerator is operating.

CORMIX – Cornell Mixing Zone Expert System (CORMIX), an EPA-supported mixing zone model for assessment of regulatory mixing zones resulting from steady, continuous point source discharges.

Cultural resources - Archaeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

Cumulative impacts/effects - In an environmental impact statement, the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or nonfederal), private industry, or individual(s) undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7).

Current - The movement of electrons in the conductors or transmission lines.

Decay heat (radioactivity) - The heat produced by the decay of certain radionuclides.

Decay (radioactive) - The decrease in the amount of any radioactive material with the passage of time due to the spontaneous transformation of an unstable nuclide into a different nuclide or into a different energy state of the same nuclide; the emission of nuclear radiation (alpha, beta, or gamma radiation) is part of the process.

Decibel (dB) - A logarithmic unit of sound measurement which describes the magnitude of a particular quantity of sound pressure power with respect to a standard reference value, in general, a sound doubles in loudness for every increase of 10 decibels.

Decibel, A-weighted (dBA) - A unit of frequency-weighted sound pressure level, measured by the use of a metering characteristic and the "A" weighting specified by the American National Standards Institute (ANSI) Si .4-1983 (RI 594), that accounts for the frequency response of the human ear.

Decommissioning - The removal from service of facilities such as processing plants, waste tanks, and burial grounds, and the reduction or stabilization of radioactive contamination. Decommissioning includes decontamination, dismantling, and return of the area to original condition without restrictions or partial decontamination, isolation of remaining residues, and continuation of surveillance and restrictions.

Decontamination - The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

Depleted uranium - A mixture of uranium isotopes where uranium-235 represents less than 0.7 percent of the uranium by mass.

Derate - Reduction in operating power production level.

Design-basis accident - For nuclear facilities, information that identifies the specific functions to be performed by a structure, system, or component and the specific values (or ranges of values) chosen for controlling parameters for reference bounds for design. These values may be (l) restraints derived from generally accepted state-of-the-art practices for achieving functional goals; (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals; or (3) requirements derived from Federal safety objectives, principles, goals, or requirements.

Design-basis events - Postulated disturbances in process variables that can potentially lead to design-basis accidents.

Distribution (electrical) - The system of lines, transformers, and switches that connect the transmission network and customer load. The transport of electricity to ultimate use points such as homes and businesses. The portion of an electric system that is dedicated to delivering electric energy to an end user at relatively low voltages.

Dose - The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad.

Dose equivalent - The product of absorbed dose in rad (or Gray) and a quality factor, which quantifies the effect of this type of radiation in fissue. Dose equivalent is expressed in units of rem or Sievert, where 1 rem equals 0.01 Sievert.

Dose rate - The radiation dose delivered per unit time (e.g., rem per year).

Dosimeter - A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., film badge or ionization chamber).

Drift - Effluent mist or spray carried into the atmosphere from cooling towers.

Drinking water standards - The level of constituents or characteristics in a drinking water supply specified in regulations under the Safe Drinking Water Act as the maximum permissible.

Effective dose equivalent - The sum of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be used to estimate the health effects risk to the exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides, and the effective dose equivalent due to penetrating radiation from sources external to the body. Effective dose equivalent is expressed in units of rem or Sievert.

Effluent - A gas or fluid discharged into the environment.

Endangered species - Any species which is in danger of extinction throughout all or significant portions of its range. The Endangered Species Act of 1973, as amended, establishes procedures for placing species on the Federal lists of endangered or threatened species.

Endangered Species Act of 1973 - The Act requires Federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to ensure that their actions likely will not jeopardize the continued existence of any endangered or threatened species, or adversely affect the habitat of such species.

Engineered safety features - For a nuclear facility, features that prevent, limit, or mitigate the release of radioactive material from its primary containment.

Entrainment - The involuntary capture and inclusion of organisms in streams of flowing water; a term often applied to the cooling water systems of power plants/reactors. The organisms involved may include phyto-and zooplankton, fish eggs and larvae (ichthyoplankton), shellfish larvae, and other forms of aquatic life.

Environment - The sum of all external conditions and influences affecting the life, development, and ultimately the survival of an organism.

Environmental justice - The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population of people should be forced to shoulder a disproportionate share of the negative environmental impacts of pollution or environmental hazards due to a lack of political or economic influence.

Exposure to radiation - The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation. Occupational exposure is the exposure to ionizing radiation that occurs at a person's workplace. Population exposure is the exposure to a number of persons who inhabit an area.

Exposure pathway - The course a chemical or physical agent takes from the source to the exposed organism. The pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from the site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (e.g., air) is included.

Fission (fissioning) - The splitting of a nucleus into at least two other nuclei and the release of a relatively large amount of energy. Two or three neutrons are usually released during this type of transformation.

Fission products - Nuclei formed by the fission of heavy elements (primary fission products); also, the nuclei formed by the decay of the primary fission products, many of which are radioactive.

Floodplain - The lowlands adjoining inland and coastal waters and relatively flat areas.

Fuel assembly - A cluster of fuel rods (or plates), also called a fuel element. Approximately 200 fuel assemblies make up a reactor core.

Fuel rod - Nuclear reactor component that includes the fissile material.

Gamma rays - High-energy, short-wavelength, electromagnetic radiation accompanying fission and either emitted from the nucleus of an atom or emitted by some radionuclide or fission product. Gamma rays are very penetrating and can be stopped only by dense materials (such as lead) or a thick layer of shielding materials.

Habitat - The environment occupied by individuals of a particular species, population, or community.

Hazardous material - A material, including a hazardous substance, as defined by 49 CFR §171.8, which poses a risk to health, safety, and property when transported or handled.

Hazardous/toxic air pollutants - Air pollutants known or suspected to cause serious health problems such as cancer, poisoning, or sickness, and may have immunological, neurological, reproductive, developmental, or respiratory effects.

Hazardous waste - Any solid waste (can also be semisolid or liquid, or contain gaseous material) having the characteristics of ignitability, corrosivity, toxicity, or reactivity, defined by the Resource Conservation and Recovery Act, and identified or listed in 40 CFR Part 261 or by the Toxic Substances Control Act.

Heat exchanger - A device that transfers heat from one fluid (liquid or gas) to another.

High efficiency particulate air filter (HEPA) - A filter used to remove very small particulates from dry gaseous effluent streams.

High(ly) enriched uranium - Uranium that is equal to or greater than 20 percent uranium-235 weight. Many of the fuels discussed in this EIS are based primarily on highly enriched uranium.

Historic resources - Archaeological sites, architectural structures, and objects produced after the advent of written history dating to the time of the first Euro-American contact in an area.

Hybernacula - Places, e.g., caves or other protected areas, where bats hibernate during the winter.

Icthyoplankton - The early life stages of fish (eggs and larvae) that spend part of their life cycle as free-floating plankton.

Impingement - The process by which aquatic organisms too large to pass through the screens of a water intake structure become caught on the screens and are unable to escape.

Interim storage - Safe and secure storage for spent nuclear fuel and radioactive wastes until the materials are treated and/or disposed of).

Ion - An atom that has too many or too few electrons, causing it to be electrically charged; an electron that is not associated (in orbit) with a nucleus.

Ion exchange - A unit physiochemical process that removes anions and cations, including radionuclides, from liquid streams (usually water) for the purpose of purification or decontamination.

Ionizing radiation - Alpha particles, beta particles, gamma rays, neutrons, high-speed electrons, high-speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

Irradiation - Exposure to radiation.

Isotope - An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons, but different numbers of neutrons and 'different atomic masses. Isotopes are identified by the name of the element and the total number of protons and neutrons in the nucleus. For example, plutonium-239 is a plutonium atom with 239 protons and neutrons.

Laydown - Area of construction site used to sort and store construction materials.

Licensee amendment - Changes to an existing reactor's operating license that are approved by the U.S. Nuclear Regulatory Commission.

Light water - The common form of water (a molecule with two hydrogen atoms and one oxygen atom, H_20) in which the hydrogen atom consists completely of the normal hydrogen isotope (one proton).

Light water reactor - A nuclear reactor in which circulating light water is used to cool the reactor core and to moderate (reduce the energy of) the neutrons created in the core by the fission reactions.

Long-term lay-up - The shutdown of a generating facility to store or reserve for future use.

Low-level waste - Waste that contains radioactivity, but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or by-product material as defined by Section lie (2) of the Atomic Energy Act of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram. Some low-level waste is considered classified because of the nature of the generating process and/or constituents, because the waste would tell too much about the process.

Macrophyte - An aquatic plant that grows in or near water and is emergent, submergent, or floating.

Makeup water - Replacement for water lost through drift, blowdown, or evaporation (as in a cooling tower).

Man-rem - Unit of radiation dose to an individual.

Maximally exposed individual - A hypothetical person who could potentially receive the maximum dose of radiation or hazardous chemicals.

Megawatt (MW) - A unit of power equal to 1 million watts. "Megawatt-thermal" is commonly used to define heat produced, while "megawatt-electric" defines electricity produced.

Millirem - One thousandth of a rem.

Minority population - A population classified by the Bureau of the Census as Black, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, and other nonwhite persons, the composition of which is at least equal to or greater than the state minority average of a defined area of jurisdiction.

National Ambient Air Quality Standards (NAAQS) - Uniform, national air quality standards established by the Environmental Protection Agency under the authority of the Clean Air Act that restrict ambient levels of criteria pollutants to protect public health (primary standards) or public welfare (secondary standards), including plant and animal life, visibility, and materials. Standards have been set for ozone, carbon monoxide, particulates, sulfur dioxide, nitrogen dioxide, and lead.

National Historic Preservation Act (NHPA) - This Act provides that property resources with significant national historic value be placed on the national Register of Historic Places. It does not require any permits, but, pursuant to Federal code, if a proposed action might impact an historic property resource, it mandates consultation with the proper agencies.

National Pollutant Discharge Elimination System (NPDES) - Federal permitting system required for water pollution effluents under the Clean Water Act, as amended.

National Register of Historic Places (NRHP) - A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance under Section 2(b) of the Historic Sites Act of 1935(16 U.S.C. 462) and Section IOI(a) (1) (A) of the National Historic Preservation Act of 1966, as amended.

Nuclear reactor - A device that sustains a controlled nuclear fission chain reaction, which releases energy in the form of heat.

Nuclear Regulatory Commission (NRC) - The Federal agency that regulates the civilian nuclear power industry in the United States.

Nuclide - A species of atom characterized by the constitution of its nucleus and, hence, by the number of protons, the number of neutrons, and the energy content.

Outfall- The discharge point of a drain, sewer, or pipe as it empties into a body of water.

Peaking capacity - The capacity of facilities or equipment normally used to supply incremental gas or electricity under extreme demand conditions. Peaking capacity is generally available for a limited number of days at a maximum rate.

Peak load - The maximum load consumed or produced by a unit or group of units in a stated period of time.

Pellets - One configuration of the reactive material in a target rod.

Person-rem - The unit of collective radiation dose to a given population; the sum of the individual doses received by a population segment.

Plume - A flowing, often somewhat conical, trail of emissions from a continuous point source.

Plume immersion - With regard to radiation, the situation in which an individual is enveloped by a cloud of radiation gaseous effluent and receives an external radiation dose.

Pressurized water reactor - A light water reactor in which heat is transferred from the core to an exchanger by water kept under pressure in the primary system. Steam is generated in a secondary circuit. Many reactors producing electric power are pressurized water reactors.

Primary system - With regard to nuclear reactors, the system that circulates a coolant (e.g., water) through the reactor core to remove the heat of reaction.

Probabilistic risk assessment - A comprehensive, logical, and structured methodology to identify and quantitatively evaluate significant accident sequences and their consequences.

Probabilistic safety assessment - A systematic and comprehensive methodology of determining the risks associated with the operation of a nuclear plant.

Probable maximum flood - The hypothetical flood (peak discharge, volume, and hydrograph shape) that is considered to be the most severe reasonably possible, based on comprehensive hydrometeorological application of Probable Maximum Precipitation, and other hydrologic factors favorable for maximum flood runoff, such as sequential storms and snowmelt.

Probable maximum precipitation - The theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year. (Reference: American Meteorological Society, 1959).

Processing (of spent nuclear fuel) - Applying a chemical or physical process designed to alter the characteristics of the spent fuel matrix.

Project area - The area within the BLN site where all construction activity would occur for either Alternative B or C. The project area includes the south security check point on Bellefonte Road shown in the map inset. The project area for the nuclear generation alternatives is shown on the B&W and AP1000 site plans (Figures 2-1 and 2-12, respectively).

Radiation - The emitted particles or photons from the nuclei of radioactive atoms. Some elements are naturally radioactive; others are induced to become radioactive by bombardment in a reactor. Naturally occurring radiation is indistinguishable from induced radiation.

Radiation shielding - Radiation-absorbing material that is interposed between a source of radiation and organisms that would be harmed by the radiation (e.g., people).

Radioactive waste - Materials from nuclear operations that are radioactive or are contaminated with radioactive material and for which use, reuse, or recovery are impractical.

Radioactivity - The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation.

Radiological - Related to radiology, the science that deals with the use of ionizing radiation to diagnose and treat disease.

Radwaste - Radioactive materials at the end of their useful life or in a product that is no longer useful and requires proper disposal.

Raw water – Untreated water from the plant intake supplied to the circulating water system and the service water system to make up for water which has been consumed and discharged as part of the system operations.

Reactor - A device or apparatus in which a chain reactor of fissionable material is initiated and controlled; a nuclear reactor.

Reactor accident - See "design basis accident; severe accident."

Reactor coolant system - The system used to transfer energy from the reactor core either directly or indirectly to the heat rejection system.

Reactor core - In a heavy water reactor: the fuel assemblies including the fuel and target rods, control assemblies, blanket assemblies, safety rods, and coolant/moderator. In a light water reactor: the fuel assemblies including the fuel and target rods, control rods, and coolant/moderator. In a modular high-temperature gas-cooled reactor: the graphite elements including the fuel and target elements, control rods, and other reactor shutdown mechanisms, and the graphite reflectors.

Reactor facility - Unless it is modified by words such as containment, vessel, or core, the term reactor facility includes the housing, equipment, and associated areas devoted to the operation and maintenance of one or more reactor cones. Any apparatus that is designed or used to sustain nuclear chain reactions in a controlled manner, including critical and pulsed assemblies and research, tests, and power reactors, is defined as a reactor. All assemblies designed to perform subcritical experiments that could potentially reach criticality are also to be considered reactors.

Record of decision (ROD) - A document prepared in accordance with the requirements of the Council on Environmental Quality and National Environmental Policy Act regulations 40 CFR §1505.2, that provides a concise public record of the decision on a proposed Federal action for which an environmental impact statement was prepared. A Record of Decision identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Regolith - A layer of loose, heterogeneous material covering solid rock.

Repository - A place for the disposal of immobilized high-level waste and spent nuclear fuel in isolation from the environment.

Reprocessing (of spent nuclear fuel) - Processing of reactor-irradiated nuclear material (primarily spent nuclear fuel) to recover fissile and fertile material, in order to recycle such materials primarily for defense programs or generation of electricity. Historically, reprocessing has involved aqueous chemical separations of elements (typically uranium or plutonium) from undesired elements in the fuel.

Resin - An ion-exchange medium; organic polymer used for the preferential removal of certain ions from a solution.

Risk - In accident analysis, the probability-weighted consequence of an accident, defined as the accident frequently per year multiplied by the dose. The term "risk" also is used commonly in other applications to describe the probability of an event occurring.

Risk assessment (chemical or radiological*)* - The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

Runoff - The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

Safety analysis report (SAR) - A safety document that provides a complete description and safety analysis of a reactor design, normal and emergency operations, hypothetical accidents and their predicted consequences, and the means proposed to prevent such accidents or mitigate their consequences.

Safety evaluation report - A document prepared by the U.S. Nuclear Regulatory Commission that evaluates documentation (i.e., technical specifications, safety analysis reports, and special safety reviews and studies) submitted by a reactor licensee for its approval. This ensures that all of the safety aspects of part or all of the activities conducted at a reactor are formally and thoroughly analyzed, evaluated, and recorded.

Scoping - The solicitation of comments from interested persons, groups, and agencies at public meetings, public workshops, in writing, electronically, or via fax to assist in defining the proposed action, identifying alternatives, and developing preliminary issues to be addressed in an environmental impact statement.

Secondary system - The system that circulates a coolant (water) through a heat exchanger to remove heat from the primary system.

Seismic Category I - Safety-related structures, systems, and components that are designed and built to withstand the maximum potential earthquake stresses for the particular region where a nuclear plant is sited, without loss of capability to perform their safety functions.

Seismicity - The tendency for earthquakes to occur.

Severe accident - An accident with a frequency rate of less than 106 per year that would have more severe consequences than a design-basis accident, in terms of damage to the facility, off-site consequences, or both. Also called "beyond design-basis reactor accidents" for this environmental impact statement.

Shutdown - For a U.S. Department of Energy (DOE) reactor, that condition in which the reactor has ceased operation and DOE has declared officially that it does not intend to operate it further (see DOE Order 5480.6, - Safely of Department of Energy-Owned Nuclear Reactors).

Source term - The estimated quantities of radionuclides or chemical pollutants released to the environment.

Spanned - Those areas of high relief where the transmission is high above the canopy such that ROW clearing is not necessary.

Spent nuclear fuel - Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not be separated.

Threatened species - Any species designated under the Endangered Species Act as likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Tier - To link to another in a hierarchical chain. An upper-tier document might be programmatic to the entire DOE complex of sites; a lower-tier document might be specific to one site or process.

Transient - A change in the reactor coolant system temperature, pressure, or both, attributed to a change in the reactor's power output. Transients can be caused by (1) adding or removing neutron poisons, (2) increasing or decreasing electrical load on the turbine generator, or (3) accident conditions.

Tritiated (liquid) - Tritiated liquid is water that contains tritium. The most common form of tritium is in water, because both radioactive tritium and nonradioactive hydrogen react with oxygen in the same way to form water. When this happens, tritium replaces one of the stable hydrogens in the water molecule, H2O, creating tritiated water, which is colorless, odorless, and radioactive.

Tritium - A radioactive isotope of the element hydrogen with two neutrons and one proton. Common symbols for the isotope are "H-3" and "T." Tritium has a half-life of 12.3 years.

Underbuilt - When one or more lines are strung on an existing transmission structure.

Uprate – The process of increasing the maximum power level a commercial nuclear power plant may operate.

Uranium - A heavy, silvery-white metallic element (atomic number 92) with several radioactive isotopes that is used as fuel in nuclear reactors.

Vault - A reinforced concrete structure for storing strategic nuclear materials used in national defense or other programmatic purposes, or for disposing of radioactive or hazardous waste.

Wetlands - Land or areas exhibiting the following: hydric soil conditions, saturated or inundated soil during some portion of the year, and plant species tolerant of such conditions; also, areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole-body dose - With regard to radiation, the dose resulting from the uniform exposure of all organs and tissues in a human body. (Also see effective dose equivalent.)

χ/Q (Chi/Q) - The relative calculated air concentration due to a specific air release and atmospheric dispersion; units are (seconds per cubic meter). For example (Curies per cubic meter)/(Curies per second)= (seconds per cubic meter) or (grams per cubic meter)/(grams per second) = (seconds per cubic meter).

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Project Number: 2009-22

VOLUME 2: APPENDICES

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

SINGLE NUCLEAR UNIT AT THE BELLEFONTE PLANT SITE
Jackson County, Alabama

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

MAY 2010

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APPENDIX A – TVA AUGUST 2009 LETTER REQUESTING DEFERRED STATUS AND NRC JANUARY 2010 LETTER AUTHORIZING BLN UNITS 1 AND 2 DEFERRED STATUS

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Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

August 10, 2009

10 CFR 50.54 (a)
10 CFR 50.55 (f)

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of) Docket No. 50-438 and 50-439
Tennessee Valley Authority)

TENNESSEE VALLEY AUTHORITY (TVA) - BELLEFONTE NUCLEAR PLANT (BLN) UNITS 1 (CPPR-122) AND 2 (CPPR-123) - TRANSITION TO DEFERRED STATUS

References:
1) Letter from A. Bhatnagar (TVA) to Eric Leeds (NRC) dated August 26, 2008, Bellefonte Nuclear Plant Units 1 and 2-Request to Reinstate Construction Permits CPPR-122 (Unit 1) and CPPR-123 (Unit 2).

2) Letter from L. Raghavan (NRC) to A. Bhatnagar (TVA), Bellefonte Nuclear Plant, Units 1 and 2-Order Granting Reinstatement of Construction Permits Nos. CPPR-122 and CPPR-123 (TAC Nos. MD9564 and MD9565, dated March 9, 2009.

3) Letter from Masoud Bajestani (TVA) to NRC, TVA Implementation of the NRC Order Granting Reinstatement of Construction Permits Nos. CPPR-122 and CPPR-123, dated May 12, 2009.

In response to TVA's request for the reinstatement of the BLN Construction Permits for Units 1 (CPPR-122) and 2 (CPPR-123) (Reference 1), NRC issued an Order (Reference 2) granting reinstatement of the BLN Construction Permits returning the facility to a "terminated plant" status under Section III.B of the Commission's Policy Statement on Deferred Plants (52 FR 38077, October 14, 1987). Shortly thereafter, TVA acknowledged the NRC's reinstatement of the Construction Permits stating that TVA had placed the units in terminated status and that TVA had revised its Nuclear Quality Assurance Plan (NQAP) to address that fact (Reference 3). In Reference 3, TVA also committed to address the elements of the Commission's Policy Statement that applied to plants in deferred status and to transition to such status as soon as practicable.

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The purpose of this letter is to confirm that TVA has established the necessary programs, policies and procedures to warrant BLN 1&2 being placed in deferred status consistent with the Policy Statement.

TVA's Bellefonte plant is located near Scottsboro, Alabama, and consists of two substantially complete Babcock and Wilcox pressurized water reactors. BLN Units 1&2 were first placed in the deferred status in 1988 and were actively maintained in that status prior to the withdrawal of the Construction Permits in 2006. Up to the time of withdrawal, NRC performed periodic inspections of the preservation and maintenance program activities and documented the results in inspection reports, indicating that the preservation and maintenance activities were being performed in an acceptable manner. During active construction and through the period of construction deferral, the Bellefonte site successfully maintained a high rating under the NRC's Systematic Assessment of Licensee Performance (SALP) Program, and the BLN construction project was specifically excluded in the September 1985 letter issued to TVA under 10 CFR 50.54(f).

Before TVA requested that NRC reinstate the Construction Permits, TVA began assessing the deferred plant programs and procedures as well as the preservation and maintenance activities that were in place while the BLN units were deferred. With this baseline of work and considering lessons-learned from the Watts Bar Unit 2 deferred plant program, TVA has developed and implemented the set of programs and procedures deemed appropriate for application to BLN Units 1&2 in deferred status. Since reinstatement of the Construction Permits in March 2009, TVA has resumed preservation and maintenance activities aimed at protecting selected plant assets. Work performed during the deferral period will support such preservation and maintenance activities and at no time during such period will work be performed which would further plant construction or completion.

TVA has examined the provisions of the Deferred Plant Policy and has addressed each of its elements to ensure continued compliance. For instance, TVA will make certain that the current Construction Permits will not expire. The expiration dates for Construction Permit Nos. CPPR-122 and CPPR-123 are October 1, 2011, and October 1, 2014, respectively. In accordance with Section III.A.2 of the Policy Statement, TVA will make a timely request for renewal of the permits in accordance with NRC's regulations.

In accordance with Section III.A.3 of the Deferred Plant Policy, TVA has established the necessary programs and procedures to maintain and preserve equipment as well as to retain and protect plant records. As mentioned above, TVA has instituted a quality assurance program under 10 CFR Part 50, Appendix B, commensurate with the level of activities at a deferred plant. Also, NRC Regulatory Guides endorsing the ANSI N45.2 series of standards, "Quality Assurance Requirements for Nuclear Power Plants," are applicable to plants under construction including Regulatory Guides 1.28, 1.37, 1.38,

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1.58, 1.88 and 1.118. The Enclosure to this letter addresses with greater specificity the elements of Section III.A.3 as they apply to BLN 1&2 in deferred plant status.

TVA recognizes the need to address the lapse in quality assurance oversight that occurred in the period from withdrawal of the Construction Permits through March 2009 when the NQAP was reestablished as described above. TVA has identified the key impacts to be addressed and has entered them into the BLN Corrective Action Program. TVA's current NQAP addresses those elements of the Deferred Plant Policy applicable to BLN, as well as the regulatory requirements that continue to apply to plants in the deferred status. TVA has also implemented work process controls to prevent construction-related activities from being conducted until the provisions of the policy regarding resumption of construction have been successfully addressed.

TVA also reviewed the new regulatory requirements that have been issued since the June 1988 deferral through July 2009. No new regulatory requirements were deemed applicable to BLN which would affect activities to be undertaken during the period of deferral.

During the deferral period and consistent with the licensing process being used at Watts Bar Unit 2, TVA plans to develop and submit a BLN Units 1&2 Key Assumptions letter for NRC's review and consideration. This Key Assumptions letter will formally document the initial licensing basis for the BLN Units based on the findings of the original BLN Construction Permits and the consideration of applicable new regulations.

As TVA stated in Reference 1, any future decision to resume BLN construction activities would require approval by the TVA Board of Directors. Should TVA decide to move forward with completion activities, it would follow the notice of resumption of construction activities included in the Deferred Plant Policy. This would include submitting a letter notifying the NRC Director of Nuclear Reactor Regulation a minimum of 120 days in advance of the intent to resume construction, along with the other information listed in Section III.A.6 of the policy.

In the event of such a decision to move forward with construction, TVA will develop a detailed Regulatory Framework for BLN 1&2. This will include review of previously issued Generic Letters, Bulletins, Circulars, and Information Notices for applicability and appropriate disposition. The Regulatory Framework would also contain a review of new standards, guidance and regulation for applicability to BLN, and review of previous commitments and open items related to licensing. NRC's formal license review would follow TVA's submittal of an updated Operating License application, including an amendment to the Bellefonte Units 1&2 Final Safety Analysis Report (FSAR) and an updated Environmental Report. NRC's review of the Operating License application would be expected to include, among other things, a review of the Probable Maximum Flood (PMF) calculation for the Bellefonte site.

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TVA understands if a decision is made to begin construction, the NRC staff will thereafter also determine the acceptability of structures, systems, and components (SSCs) important to safety under 10 CFR Part 50, Appendix A. TVA recognizes that the limited activities performed while the plant is in deferred status, as well as NRC inspections performed during that period, will be utilized to determine the acceptability of SSCs important to safety. At the appropriate time, TVA intends to develop programs for BLN 1&2 similar to those that are being implemented at Watts Bar Unit 2 for the configuration control process and the corresponding programs to evaluate, refurbish, restore or replace SSCs.

Efforts to transition BLN Units 1&2 to deferred plant status do not affect, in any way, TVA's ability or current plans to pursue a Combined License for BLN Units 3&4 under 10 CFR Part 52, and the licensing information submitted to the NRC for the purpose of supporting the Combined License Application remains valid. The transition to deferred plant status has always been considered as a necessary step in TVA's assessment of the viability of BLN Units 1&2 as a baseload generation option. Should TVA decide to reactivate construction in the future, TVA will address the resulting impacts on the BLN Unit 3&4 Combined License Application.

In Reference 1, TVA described the Environmental Assessment which it conducted in connection with its request for reinstatement of the BLN Units 1&2 Construction Permits and returning the plant to deferred status. TVA concluded that the limited consequences of reinstating the Construction Permits in deferred status would not have a significant effect on the quality of the human environment. The NRC Staff prepared an "Environmental Assessment and Finding of No Significant Impact" (74 FR 9308, March 3, 2009) in which it determined that reinstating the Construction Permits and placing the facility in terminated status will not have a significant impact on the environment. TVA has reconfirmed that the limited activities to be conducted during the deferral period remain bounded by the limited impacts to the environment described in the NRC's Environmental Assessment.

TVA has identified those Federal, State and local license and permit requirements that are applicable to the BLN Units 1&2 in deferred status. TVA confirmed that the applicable licenses and permits remain current and that renewal processes are being included in the integrated project schedule.

In conclusion, TVA has taken the necessary actions to address those elements of the Commission's Policy Statement for Deferred Plants to allow BLN 1&2 to be placed in deferred status. In order to confirm compliance with the policy, TVA performed a multi-level readiness assessment which included internal and external reviews by nuclear Quality Assurance and licensing experts, as well as a formal TVA Nuclear Quality

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Assurance Audit performed in accordance with TVA NQAP requirements. The results of these assessments are documented and any necessary follow-up actions are being addressed under the BLN Corrective Action Program. In accordance with the NRC's Order reinstating the Construction Permits, TVA respectfully requests that NRC authorize placement of BLN Units 1&2 in deferred plant status.

If you have questions or require additional information, please do not hesitate to contact Andrea Sterdis, Manager, Nuclear Generation Development and Construction Licensing. Andrea can be reached via email at andreasterdis@tva.gov or by phone at 423-751-7119.

Ashok Bhatnagar
Senior Vice President
Nuclear Generation Development & Construction

Enclosure
cc: See page 8

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ENCLOSURE
BELLEFONTE NUCLEAR POWER PLANT UNITS 1 AND 2
TRANSITION TO DEFERRED STATUS

In accordance with NRC's Policy Statement on Deferred Plants, TVA has addressed the elements of the policy which apply to the maintenance and preservation of equipment as well as the retention and protection of plant records at BLN Units 1&2. (Section III.A.3)

TVA has implemented a Quality Assurance Program that complies with the applicable requirements of 10 CFR 50, Appendix B for BLN Units 1&2 as documented in Appendix G of the TVA Nuclear Quality Assurance Program (NQAP). TVA has also established an organization and management team that is well qualified and experienced to carry out their responsibilities for site activities. The management team includes a Project Director (who reports directly to the Vice President of Nuclear Generation Development) and experienced, senior managers within the disciplines of engineering, training, construction, licensing, project controls and nuclear operations. In addition, a Project Nuclear Assurance Manager has been appointed and reports to the General Manager for Nuclear Generation Development and Construction Oversight. In accordance with 10 CFR Appendix B and the TVA NQAP, the Bellefonte Nuclear Assurance Manager is independent of the Bellefonte Project Management organization.

Under the terms of the Bellefonte Quality Assurance Program, necessary programs and procedures have been re-established and implemented to address the maintenance, preservation, and documentation of equipment provisions of the Deferred Plant Policy as they apply to deferral-related activities that are being performed at the site. These activities include the following:

- Preventative maintenance and layup activities are being performed under established programs and procedures which limit physical work on plant systems, structures and components (SSCs) as appropriate. Controls preventing active construction activities are in place.

- Asset preservation activities are being performed under established programs and procedures which limit physical work on plant SSCs to that which is necessary for maintenance and preservation of plant assets. Controls preventing active construction activities are in place.

- Plant documentation is preserved and maintained under records control programs which include physical security, access, change management and environmental controls.

- A Corrective Action Program has been established which describes processes and responsibilities for documenting and resolving problems, including conditions adverse to quality and significant conditions adverse to quality, pertaining to site activities in the deferred plant status. The BLN Corrective Action Program meets the requirements of the TVA NQAP and is similar to the programs implemented at the TVA operating units and at Watts Bar 2.

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August 10, 2009

- Prompt identification, documentation, evaluation, and correction of adverse conditions, including the reporting requirements of 10 CFR 21, 10 CFR 50.55(e) and 10 CFR 50.71 are addressed through re-established reportability programs. Initial screening of deficiencies for reportability is performed as part of the Problem Evaluation Report initiation process within the Corrective Action Program.

- Housekeeping, equipment protection and materials handling activities are performed in a manner consistent with standards contained in ANSI N45.2 per the commitments in the TVA NQAP. Housekeeping activities include the inspections, initiation of corrective actions, and documentation and assignment of responsibilities for general housekeeping in plant areas used for the performance of work activities which could affect nuclear quality. Site programs and procedures also define the requirements and establish controls for the storage and handling of materials received at the BLN site.

- A security program has been established which provides protective measures to prevent unauthorized intrusion as well as the positive control of materials and equipment at the BLN site.

- TVA has developed a plan for resolving hardware and records issues resulting from the lapse in QA oversight during the period when the Construction Permits were withdrawn and TVA began an investment recovery program. The construction status for BLN Units 1&2 at the time that the Construction Permits were withdrawn was documented in the plant's Engineering, Construction, Monitoring and Documentation (ECM&D) Database. Prior to Construction Permit withdrawal, the construction status, including documentation, was controlled under the NQAP and was the subject of successful TVA Nuclear Quality Assurance Audits and NRC inspections. In 2008, and after investment recovery activities were halted, TVA began construction status verification activities in order to identify and document deviations from the previously established construction status. These verification activities focused on the impacts of the investment recovery program and included detailed engineering walk downs and documentation of the affected areas. To consolidate the resulting documentation changes, the ECM&D database is currently being updated.

- TVA has planned additional activities to address plant-wide configuration control as well as the re-establishment of required design qualifications for plant SSCs. Detailed system walk downs will be conducted to verify and document plant configuration plant SSCs. The programs that are being developed are similar to those that are being implemented at Watts Bar Unit 2 for configuration control as well as to evaluate, refurbish, restore or replace SSCs.

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Page 8
August 10, 2009

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August 10, 2009

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January 14, 2010

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SUBJECT: BELLEFONTE NUCLEAR PLANT, UNITS 1 AND 2—REQUEST TRANSITION TO DEFERRED PLANT STATUS (TAC NOS. ME1904 AND ME1905)

Dear Mr. Bhatnagar:

By letter dated August 10, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092230594), the Tennessee Valley Authority (TVA), holder of Construction Permit (CP) Nos. CPPR-122 and CPPR-123 for the construction of Bellefonte Nuclear Plant (BLN), Units 1 and 2, respectively, requested that the U.S. Nuclear Regulatory Commission (NRC) authorize placement of BLN, Units 1 and 2, into "deferred plant" status. The Commission's Policy Statement on Deferred Plants, as published in the *Federal Register* (FR) on October 14, 1987 (52 FR 38077), outlines the NRC's regulatory provisions for deferring and preserving a deferred nuclear power plant until such time as it may be reactivated.

Currently, BLN, Units 1 and 2, are in "terminated plant" status. (The Commission's policy statement defines a "deferred plant" as one "at which the licensee has ceased construction or reduced activity to a maintenance level, maintains the construction permit (CP) in effect, and has not announced the termination of the plant." A "terminated plant" is one "at which the licensee has announced that construction has been permanently stopped, but which still has a valid CP.") TVA has not requested any amendment to the CPs for BLN, Units 1 and 2.

The NRC staff has reviewed information that TVA submitted in its August 10, 2009, letter. The NRC staff conducted an inspection of TVA activities associated with the "deferred plant" status. Based on its review of the TVA submittal and the inspection results, the NRC staff has completed its assessment of TVA's construction deferral program and its implementation.

Background

In an order issued on March 9, 2009, reinstating the CPs for the construction of BLN, Units 1 and 2, and returning the facility to "terminated plant" status, the NRC specified the following:

> Should TVA choose to pursue placement of the facility in a deferred plant status, it shall ensure to the satisfaction of the NRR [Office of Nuclear Reactor Regulation] Director that it has complied with the guidance and provisions under Section III.A, "Deferred Plant," of the Commission's Policy Statement on Deferred Plants. When the results of its evaluation and inspection are satisfactory, the

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NRR Director may then authorize placement of the facility in a deferred plant status.

Staff Assessment

The Commission's policy statement identifies the areas of consideration should a facility be placed in a "deferred plant" status: On this basis, the NRC staff considered the following items in conducting its review:

- the notification of plant deferral
- the extension of the CPs
- the maintenance, preservation, and documentation (MPD) of equipment
- the conduct of review during deferral
- the applicability of new regulatory requirements during the period of deferral

In addition, on October 5, 2009, the staff issued "Bellefonte Nuclear Plant Units 1 and 2—Staff Plan for Assessment of Transition to Deferred Plant Status" (Bellefonte Assessment Plan or the Plan) (ADAMS Accession No. ML092740149) to provide guidance for its assessment of TVA's request related to these areas. In addition, to the requirements in the Commission's policy statement, the Plan identified other areas for consideration. These areas involved the TVA plans for resolving a hydrology issue; proposed site activities during the period of deferral to ensure that these activities remain bounded by the environmental impact statement for the CPs; status of other Federal, State, and local government requirements; and implications for the review of the combined license application for BLN, Units 3 and 4.

The following provides the basis for the NRC staff's determination.

1.0 Notification of Plant Deferral

In addition, to informing the NRC when a plant is to be deferred, the Commission's policy statement indicates that information be made available that includes the reason for deferral; expected reactivation date, if known; whether it will submit an extension to the CPs; and its plans for fulfilling the requirements of the CPs, including MPD. TVA provided the information in its August 10, 2009, letter and informed the NRC of its plan to place BLN, Units 1 and 2, in "deferred plant" status.

TVA has not determined a date for reactivating the construction of BLN, Units 1 and 2. However, TVA indicated that, should it decide to reactive construction, it would submit a letter 120 days before resuming construction and provide the required information in accordance with the Commission's policy statement. Further, on November 4, 2009, TVA published a draft supplemental environmental impact statement to inform decision makers, agencies and the public about the potential for environmental impacts that would result from a decision to complete or construct and operate a single nuclear generating unit at the BLN site. TVA considered the action alternatives of completion and operation of a Babcock and Wilcox pressurized light water reactor or construction and operation of a Westinghouse AP1000 advanced pressurized light water reactor.

TVA's plans for fulfilling the requirements of the CPs will be verified through periodic NRC inspection.

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Thus, the NRC staff finds that TVA has provided sufficient information to meet the provisions for notification of plant deferral in the Commission's policy statement.

2.0 Extension of Construction Permits

CP No. CPPR-122 for BLN, Unit 1, will expire on October 1, 2011, and CP No. CPPR-123 for BLN, Unit 2, will expire on October 1, 2014. TVA has not requested any changes to these dates. Thus, the NRC staff finds that TVA has provided sufficient information to meet this provision of the Commission's policy statement.

3.0 Maintenance, Preservation, and Documentation of Equipment

The Commission's policy statement addresses the regulations and guidance applicable to deferred and terminated plants, quality assurance (QA) requirements, MPD requirements for deferred plants, and the application of new regulatory requirements to deferred plants upon reactivation and other general administrative considerations. The QA program implemented during the deferral should include a description of the planned activities; organizational responsibilities and procedural controls that apply to the verification of construction status; MPD of equipment and materials; and retention and protection of QA records. For plants in a deferred status, Section III.A.3 of the Commission's policy statement states that an applicant may modify its commitments related to the regulatory requirements (i.e., those that apply to plants under construction) commensurate with the expected activities during deferral.

In its enclosure to the August 10, 2009, letter, TVA addressed these elements of the Commission's policy statement.

TVA's nuclear quality assurance program (NQAP) covers both the operating plants and those under construction, including MPD. Appendix G to the NQAP, which was provided to the NRC in Revision 20, addresses the QA requirements related to the construction of BLN, Units 1 and 2. It describes and establishes the administrative controls needed to meet the requirements of Appendix B to 10 CFR Part 50, the Commission's policy statement, and the NRC's order reinstating the CPs for BLN, Units 1 and 2.

The staff determined that TVA has reestablished the necessary QA programs and procedures in accordance with its NQAP. As discussed in NRC Inspection Report Nos. 05000438/2009601 and 05000439/2009601, dated December 2, 2009 (ADAMS Accession No. ML093370083), the staff assessed the TVA QA activities, including organizational responsibilities; programs and procedural controls that apply to the verification of construction status; MPD of equipment and materials; retention and protection of QA records; the reporting of deficiencies in design, construction, and QA; and the reporting of defects and noncompliances during deferral. The NRC staff concludes that TVA's QA activities and actions associated with MPD of equipment satisfy the criteria in the Commission's policy statement. The NRC performs inspections periodically to examine implementation of the program to determine compliance with commitments and overall program effectiveness.

4.0 Conduct of Review during Deferral

TVA tendered its application for an operating license (OL) for BLN, Units 1 and 2, on February 1, 1978. The NRC completed its acceptance review and docketed the application on June 6, 1978. Because of TVA's prior decision to terminate construction of BLN, Units 1 and 2, there are no ongoing reviews of the OL application. In addition, TVA has not requested any modification to the CPs, which would require NRC review and approval. Thus, the NRC staff does not plan to conduct the review of any licensing actions during the period of deferral. The staff finds that the provisions of the Commission's policy statement in this area have been met.

In the event that it decides to resume active construction, TVA will notify the NRC of its decision in a letter that it will submit 120 days before it resumes construction and will provide the other information listed in Section III.A.6 of the Commission's policy statement, including key assumptions and a detailed regulatory framework for reactivating construction. These documents will address the plant's status related to previously issued generic letters, bulletins, circulars, and information notices for applicability, new standards, guidance and regulation for applicability to BLN, and commitments and open items related to licensing. TVA will also submit an updated OL application, including an amendment to the BLN, Units 1 and 2, final safety analysis report and updated environmental report.

5.0 Applicability of New Regulatory Requirements during Deferral

In its August 10, 2009, letter, TVA indicated that it has reviewed the new regulatory requirements that have been issued since plant deferral (in June 1988) through July 2009 and determined that there are no new applicable regulatory requirements that would affect activities during the period of deferral. Thus, the staff finds that TVA satisfies the criteria in the Commission's policy statement.

6.0 Additional Considerations

As described in the assessment plan dated October 5, 2009, the NRC staff addressed certain additional considerations, which were not needed for determining compliance with the provisions of the policy statement related to transition to "deferred plant" status. However, the staff assessed them to ensure that these items would not create other issues after the staff makes its determination on deferral status. The staff found that TVA has established procedural controls to ensure maintenance activities performed while in a terminated or deferred plant status do not advance construction of the plants. The NRC staff verified that TVA's controls are adequate to ensure that proposed site activities do not advance construction and do not affect the conclusions in the environmental impact statement for the CPs. By letter, dated December 2, 2009, TVA confirmed that the National Pollutant Discharge Elimination System permit and other Federal, State, and local licenses and permits are current. The NRC staff finds that TVA has confirmed that applicable licenses and permits remain current and a renewal process is included in project schedule.

7.0 Inspections

From October 19 to October 23, 2009, the NRC staff conducted an inspection of BLN, Units 1 and 2. NRC Inspection Report Nos. 50-438/2009601 and 50-439/2009601, dated December 2, 2009, document the results of the inspection.

The NRC staff conducted the inspection to identify the status of the applicable program areas specified in Section III.A of the Commission's policy statement. Within these areas, the inspection consisted of selected examinations of procedures and representative records, interviews with personnel, equipment status verification, and observations of program and process implementation.

The inspection verified that TVA had properly implemented the NRC-approved QA program and established processes and controls necessary to comply with regulatory requirements associated with its CPs. The inspection determined that TVA's QA organizational structure and functional relationships were clear and that the equipment covered under the QA plan are properly identified and scoped. The inspection found that TVA's audits and self-assessments conducted to assess readiness to transition to a deferred plant status were of good quality. The inspection reviewed BLN procedures for the reporting of 10 CFR 50.55(e) construction deficiencies and 10 CFR 21.21, "Notification of Failure To Comply or Existence of a Defect and Its Evaluation," defects and noncompliances and verified the program was effectively implemented. Issues were appropriately entered into the corrective action program, and the corrective actions taken were sufficient to correct the identified conditions. Through the review of a sample of documents, the inspection verified that TVA properly prepared, approved, stored, and controlled documents in accordance with its QA requirements. Through discussions with TVA personnel and a review of procedures and documentation, the inspection determined that TVA has adequately addressed the impact of investment recovery activities without proper QA control on the SSCs. TVA considers the condition of all onsite SSCs to be indeterminate. Therefore, the preventive maintenance activities currently identified are those deemed necessary for investment protection. At a later date, TVA plans to individually assess the condition and safety classification of all SSCs. The inspection reviewed controls established for work activities performed during deferred construction and determined that specific guidance is provided that prohibits any work that could be identified as furthering plant construction or completion.

The NRC inspection concluded that TVA has developed programs and procedures and is properly implementing related activities to support transition to deferred status. As specified in the Commission's policy statement, the NRC staff plans to perform future inspections of TVA's QA activities during deferred construction.

Assessment Conclusion

Based on the above discussions and the inspection results, the NRC staff has determined that TVA has addressed those elements of the Commission's policy statement to allow BLN, Units 1 and 2, to be placed in "deferred plant" status. The NRC will continue to periodically inspect the implementation of TVA's QA program and site activities during deferral to determine TVA's compliance with commitments and overall program effectiveness. Should information subsequently become available that the NRC did not consider during its review or that conflicts with earlier information, the NRC will evaluate the information to determine what effects it may have on this conclusion.

Therefore, I authorize placement of BLN, Units 1 and 2, into "deferred plant" status in accordance with the Commission's direction in Staff Requirements Memorandum COMSECY-08-0041, "Staff Recommendation Related to Reinstatement of the Construction Permits for Bellefonte Nuclear Plant, Units 1 and 2," dated February 18, 2009 (ADAMS Accession No. ML090490838).

Sincerely,

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Docket Nos. 50-438 and 50-439

A. Bhatnagar - 6 -

with earlier information, the NRC will evaluate the information to determine what effects it may have on this conclusion.

Therefore, I authorize placement of BLN, Units 1 and 2, into "deferred plant" status in accordance with the Commission's direction in Staff Requirements Memorandum COMSECY-08-0041, "Staff Recommendation Related to Reinstatement of the Construction Permits for Bellefonte Nuclear Plant, Units 1 and 2," dated February 18, 2009 (ADAMS Accession No. ML090490838).

Sincerely,

/RA/

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Docket Nos. 50-438 and 50-439

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OFFICIAL AGENCY RECORD

APPENDIX B – NRC REPORTS ON 2009 BLN INSPECTION FOR TRANSITION TO DEFERRED STATUS

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December 2, 2009

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SUBJECT: BELLEFONTE NUCLEAR PLANT UNITS 1 (CPPR-122) AND 2 (CPPR-123) - TRANSITION TO DEFERRED STATUS - NRC INSPECTION REPORT 05000438/2009601 AND 05000439/2009601

Dear Mr. Bhatnagar:

On October 23, 2009, the Nuclear Regulatory Commission (NRC) completed an inspection at your Bellefonte Nuclear Plant, Units 1 and 2 associated with transition to a "Deferred Plant" status, as defined by the Commission Policy Statement on Deferred Plants. The enclosed report documents the inspection results which were discussed on October 23, 2009, with yourself and other members of your staff.

The purpose of the inspection was to identify the status of the applicable program areas, specified in Section III.A, "Deferred Plant", of the Commission Policy Statement on Deferred Plants (52 FR 38077), currently established at the Bellefonte Nuclear Plant. Primarily, the NRC recognized the need to address the lapse in Quality Assurance (QA) oversight and investment recovery consequences that occurred in the period from withdrawal of the site's Construction Permits until when the QA program was reestablished. Specific actions were taken to evaluate if Tennessee Valley Authority (TVA) had properly implemented the NRC-approved QA program, adequately addressed the status and quality of currently installed and stored equipment, and established associated processes and controls necessary to comply with regulatory requirements associated with your construction permits. Specific areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selected examinations of procedures and representative records, interviews with personnel, equipment status verification, and observations of program and process implementation. Based on the results of this inspection, no violations of NRC requirements were identified. In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS).

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TVA 2

ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Robert C. Haag, Chief
Construction Projects Branch 3
Division of Construction Projects

Docket Nos. 50-438, 50-439
Construction Permit Nos. CPPR-122, CPPR-123

Enclosure: NRC Inspection Report 50-438/09-01 AND 50-439/09-01
w/Attachment - Supplemental Information

cc w/encl: (See page 3)

☐ PUBLICLY AVAILABLE ☐ NON-PUBLICLY AVAILABLE ☐ SENSITIVE ☐ NON-SENSITIVE
ADAMS: ☐ Yes ACCESSION NUMBER: ML093370383 ☐ SUNSI REVIEW COMPLETE

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Letter to Ashok S. Bhatnagar from Robert Haag dated December 2, 2009.

SUBJECT: BELLEFONTE NUCLEAR PLANT UNITS 1 (CPPR-122) AND 2 (CPPR-123) - TRANSITION TO DEFERRED STATUS - NRC INSPECTION REPORT 05000438/2009601 AND 05000439/2009601

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: Construction Permit Nos:	50-438 and 50-439 CPPR-122 and CPPR-123
Report Nos:	50-438/2009601 and 50-439/2009601
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Bellefonte Nuclear Plant, Units 1 & 2
Location:	Bellefonte Road Hollywood, AL 35752
Dates:	October 19 - 23, 2009
Inspectors:	J. Baptist, Senior Project Inspector, Division of Construction Projects (DCP), Construction Projects Branch (CPB) 3, Region II (RII) M. Sheikh, Senior Project Inspector, DCP, CPB 4, RII W. Fowler, Project Inspector, DCP, CPB 2, RII C. Julian, Senior Project Manager, Division of Construction Inspection (DCI), Construction Inspection Branch (CIB) 1, RII J. Blake, Senior Program Inspector, DCI, CIB 3, RII
Approved by:	Robert C. Haag, Chief Construction Projects Branch 3 Division of Construction Projects

Enclosure

EXECUTIVE SUMMARY

Bellefonte Nuclear Plant, Units 1 and 2
NRC Inspection Report 05000438,439/2009601

The inspection included aspects of engineering and construction activities, performed by Tennessee Valley Authority (TVA), associated with the Bellefonte Nuclear Plant (BLN), Units 1 and 2 project. This report covered a one-week period of inspections in the areas of quality assurance (QA); identification and resolution of problems; maintenance activities; engineering activities; access controls; and control of documents and records. The inspection guidance was primarily performed under NRC inspection procedure (IP) 92050, "Review of Quality Assurance for Extended Construction Delay."

The inspection evaluated if TVA had properly implemented the NRC-approved QA program, adequately addressed the status and quality of currently installed and stored equipment following investment recovery activities, and established associated processes and controls necessary to comply with regulatory requirements associated with its construction permits. The inspection evaluated the status of the applicable program areas, specified in Section III.A, "Deferred Plant", of the Commission Policy Statement on Deferred Plants through examination of procedures and representative records, interviews with personnel, equipment status verification, and observations of program and process. The inspection concluded that TVA has established the necessary programs to support transition to deferred status, consistent with the Commission Policy Statement for Deferred Plants. The inspection results are discussed in detail below.

Inspection Results:

- The QA organizational structure and functional relationships were clearly stated. The equipment that the TVA QA plan covers was properly identified and scoped. Work and inspection activities were performed by qualified personnel using approved procedures. (Section I.Q.1)

- Audit procedures were adequate and the audits and self-assessments conducted to assess readiness to transition to a deferred plant status were of good quality. (Section II.C.1)

- The corrective action program (CAP) procedures were established to support transition to deferred status. Licensee management was actively involved and emphasized the need for all employees to identify and report problems. (Section II.C.1)

- The licensee had a process established, governing site procedures applicable to determination of construction status and maintenance activities, to support transition to deferred status. (Sections III.E.1 and IV.M.1.1)

- Documentation was found to be properly prepared, reviewed, approved, and distributed. QA records were stored, maintained, and controlled in a manner to support transition to deferred status. (Section V.R.1)

REPORT DETAILS

Summary of Plant Status

During the inspection period, Bellefonte Nuclear Plant (BLN), Units 1 and 2 remained in a "terminated plant" status, as defined by the Commission Policy Statement on Deferred Plants (52 FR 38077)

I. Quality Assurance (QA) Program Structure and Implementing Procedures

Q.1 QA Organization and Procedures (IPs 92050, 35060, 35100, 36100)

a. Inspection Scope

The team reviewed programs and procedures, and interviewed personnel, to determine the adequacy of the Tennessee Valley Authority (TVA) QA program as it supports transition of BLN to deferred plant status. The QA program was specified in TVA Nuclear Quality Assurance Plan (NQAP), TVA-NQA-PLN89-A, Revision (Rev.) 21, with some requirements specific to the BLN delineated within paragraphs of the main body of the NQAP and the general description of how the NQAP was to be implemented at the site provided by Appendix G to the NQAP.

The adequacy of implemented procedures was evaluated on a sampling basis and actual procedural implementation was inspected to ensure that work was performed in accordance with procedural requirements.

The team reviewed the licensee's procedure, BLN Site Standard Practice (SSP)-2.3, "Administration of Site Procedures," Rev. 13, to identify if it had been revised to provide guidance to ensure that quality-related activities would be performed using documented procedures and instructions appropriate for a deferred plant.

The team assessed the adequacy of the QA program audit procedures. The team reviewed TVA procedure NAPD-2, "Audits", and the specific provisions for BLN contained in SSP-3.1, "Conduct of Quality Assurance." The team reviewed the results of internal and external audits and self-assessments conducted during 2009, as listed in the attachment to this report. The team evaluated the results of the audits to determine the type of audit findings and recommendations, as well as, what actions were taken to address the audit results.

The team reviewed BLN procedure SSP-2.9, "Records Management," Rev. 15. The review included evaluation of completeness of procedure instructions and guidance, assessment of staff's knowledge of the procedure, and evaluation of program implementation.

The team reviewed BLN procedures for the reporting of 10 CFR 50.55(e) construction deficiencies and 10 CFR 21.21 defects and non-compliances. This review included verification of effective program implementation and the completeness of guidance used to evaluate whether or not an item is reportable.

Additional documents reviewed are listed in the attachment.

b. Observations

The QA organizational structure and functional relationships were clearly stated. The qualifications, responsibilities, and duties of QA personnel, including independence from personnel having cost or scheduling responsibilities, were well defined. Methods were established to ensure that procedures were developed, approved before use, complete, and controlled, and those performing QA inspection activities had available to them the most recent approved version. The equipment covered by the QA plan was properly identified and scoped; work and inspection activities were performed by qualified personnel using approved procedures.

The team verified that the education and experience of the BLN Project Nuclear Assurance (NA) Manager met the minimum requirements specified in TVA NQAP Paragraph C of § 4.1.6, "Nuclear Assurance."

During interviews, the team noted that due to the low level of activity at BLN, the NA manager was the only QA staff permanently assigned to the site. Other supporting QA personnel were borrowed from the corporate NA offices as needed to support audit or assessment activities. Accordingly, until construction activities resume involving QA-related structures, systems, and components (SSCs), the licensee does not plan to permanently staff local QA/Quality Control (QC) personnel.

BLN procedure SSP-2.3, "Administration of Site Procedures," Rev. 13, had been revised to reflect activation of the procedure after reinstatement of BLN construction permits (CPs) and to reflect site organizational changes. This procedure provided direction for the administration and revision of procedures required for manipulations of, and performance of work on, plant equipment.

The team verified that procedures clearly outlined the process for identifying deficiencies and determining whether an item is reportable. These procedures included provisions for submitting initial reports, as well as interim reports, should meeting the final report due date become unachievable. In addition, procedural attachments provided step-by-step guidance on evaluating whether a substantial safety hazard (SSH) or deviation exists. Reporting timeframes and NRC contact information was provided and was accurate. The team also reviewed evaluations for reportability associated with a failed tendon coupling in the BLN Unit 1 tendon gallery and determined the licensee had properly implemented their procedural guidance. TVA informed the team that this reportability evaluation will be reviewed when additional information regarding the failure mechanism and applicability to other tendon couplings becomes available.

During 2009, several voluntary audits and self-assessments were conducted to determine BLN readiness to transition from a terminated plant status to a deferred plant status. The audits were found to have followed approved procedures while the findings and recommendations were appropriately critical.

The team examined BLN's records retention program. The implementing procedure, SSP-2.9, "Records Management," Rev. 15, included specific instructions for records creation, identification, and storage. The team observed that the procedure required sufficient records and documentation be prepared to provide evidence of the quality of items or activities affecting quality. In addition, the procedure provided guidance regarding records processing, indexing specifications for timely retrieval, maintenance, and lifetime storage. The team observed that the procedure discussed replacing lost, damaged, or contaminated records, and access to QA records.

c. Conclusions

The team concluded that deficiency and non-compliances procedures were adequate and provide ample direction to perform timely notification to the NRC with a report that includes all required information.

The team concluded that the audit procedures were adequate and the audits and self-assessments conducted to assess readiness to transition to a deferred plant status were of good quality.

The team concluded that the licensee has a QA plan in place that is commensurate with the level of activities during the expected construction activities and delay to support transition to deferred plant status, consistent with the Commission Policy Statement.

II. Corrective Action Program (CAP)

C.1 CAP Implementation (IPs 92050, 35100)

a. Inspection Scope

The team reviewed TVA NQAP § 10.0, "Adverse Conditions" and BLN procedure SSP-3.4, "Corrective Action Program," Rev. 13, for guidance on the identification and resolution of conditions adverse to quality. The team also reviewed numerous problem evaluation reports (PERs), interviewed personnel regarding their understanding of the CAP process and concerns resolution program (CRP), attended management review and screening meetings, and interviewed the CAP staff regarding their role in CAP implementation.

Specifically, the team reviewed several PERs to verify that initiation level was appropriate, condition classification criteria were followed, management review and action was appropriate, and resolution of the issue was sufficient. The team also conducted a detailed review to assess the adequacy of the root-cause and apparent-cause evaluations of the problems identified. The team reviewed these evaluations against the descriptions of the problem described in the PERs and the guidance in licensee procedures. The team assessed the licensee's ability to determine the cause(s) of identified problems and consideration of the following: issue reportability, common cause, generic concerns, extent-of condition, and extent-of-cause. The review also assessed if the licensee had appropriately identified and prioritized corrective actions to prevent recurrence.

The team also reviewed the findings and recommendations from four internal audits and self-assessments, one self-assessment follow-up, and one external assessment performed by industry consultants.

Additional documents reviewed are listed in the attachment.

b. Observations

The team determined that the procedures, for identification and correction of conditions adverse to quality, were adequately established and had sufficient detail regarding initiating threshold and classification criteria. Also, procedures were established to preclude repetition of activities adverse to quality and provisions were established for escalating, to higher management, those corrective actions that were not adequate and/or timely. Additionally, a management system was established for overview of trends in conditions adverse to quality. BLN personnel were familiar with the PER initiation process, understood the PER classification criteria, and displayed a willingness to identify conditions adverse to quality. The management review committee (MRC) membership and mission were sufficient to ensure that PER classification and resolution complied with written procedures.

The team found that the licensee has been effective in identifying, classifying, and resolving conditions adverse to quality and has incorporated lessons learned from the development and implementation of a CAP at BLN. Management involvement was adequate, issues were properly challenged, and timeliness goals were adequately established.

One item that was found unique to the BLN CAP was the classification of a PER component as "inactive." In the event a PER is written and an aspect of the PER would not be resolved until active construction begins (i.e. equipment is identified as degraded), the CAP allows the PER to be classified as "inactive". The team reviewed the criteria for making this determination, including the processes in place to bring these items to resolution, and found the controls to be adequate.

The audit reports were of good quality and the resulting issues and recommendations were pertinent and clearly presented. The team reviewed the PERs generated by TVA, in response to the audit issues and recommendations, and the corrective actions taken or planned. In instances where no new PER was initiated, the team determined that those conditions were previously identified in other corrective action documents. The team did identify two instances where PER documentation of corrective actions was not completely accurate. TVA initiated PERs to correct those conditions.

Based on the interviews conducted and the PERs reviewed, the team determined that licensee management emphasized the need for all employees to identify and report problems using the established methods of the CAP and CRP. These methods were readily accessible to all employees. Based on discussions conducted, with a sample of plant employees from various departments, the team determined that employees felt free to raise issues and that management encouraged employees to place issues into the CAP for resolution. The team did not identify any reluctance, on the part of the licensee staff, to report safety concerns.

c. Conclusions

The team concluded that the licensee had a CAP that was commensurate with the level of activities during the expected construction delay to support transition to deferred plant status.

III. Evaluation of Current Plant Status

E.1 Assessment of Current Plant Status (IP 92050)

a. Inspection Scope

In October 2005, TVA requested that the CPs be withdrawn and ceased all quality-related activities. At that time, BLN was maintaining current plant status in the Engineering, Construction, Maintenance, and Documentation (ECM&D) database. After the CPs were withdrawn in 2006, TVA terminated the BLN QA program and started investment recovery (salvage) activities. Because recovery activities took place without the controls of a QA program, the status and quality of currently installed and stored equipment is unknown. TVA also recognized that potential collateral effects/damage to plant equipment could have occurred during recovery activities. TVA ceased investment recovery activities when they decided BLN was a viable option for completion and subsequently implemented an NRC-approved QA program.

During this inspection, the team reviewed procedures, inspected plant hardware, and interviewed personnel to verify the implementation of TVA's program for the assessment of the plant status for the BLN. At the time of the inspection, TVA was in the process of attempting to re-establish configuration control of BLN through the "configuration recovery" efforts being conducted by contractor, Sargent & Lundy[LLC] (S&L)

The team reviewed the S&L procedures for the determination of plant system status. The S&L procedures and a brief description of the program are as follows:

PI-TVAN-06, Rev. 1, 12/03/2008, *Bellefonte Nuclear Plant Configuration Recovery.* Phase 1 of the configuration recovery project involving the mark-up of piping and instrumentation drawings (P&ID) and electrical schematic drawings to clearly identify mechanical and electrical components that had been removed during investment recovery (salvage) operations.

PI-TVAN-07, Rev. 0, 02/02/2009, *Bellefonte Nuclear Plant Configuration Control Assessment.* This program was the method for conducting an assessment of the ECM&D configuration control process at BLN. The assessment was done by selecting a sample of various plant components and comparing the in-plant configuration with construction documents/records to check for agreement.

PI-TVAN-08, Rev. 1, 04/13/2009, *Bellefonte Nuclear Plant Configuration Recovery Record/Identification.* This procedure provided instruction for Phase 2 of the Sergeant and Lundy program for configuration recovery at BLN. This phase used the results of the phase 1 program to identify the construction records within ECM&D database which were impacted by the removal of equipment.

PI-TVAN-09, Rev. 0, 07/13/2009, *Bellefonte Nuclear Plant Configuration Recovery Record Update.* This procedure described Phase 3 of the program and involved the updating of the various construction documents/records that were impacted by equipment that was removed during the investment recovery effort at BLN. The Phase 3 effort was designed to generate a report defining the type of records that were updated and the outstanding items that must be processed during the BLN Detailed, Scoping, Estimating, & Planning (DSEP) effort and/or items that must be processed during the construction effort.

PI TVAN 10, Rev. 0, 09/08/2009, *Bellefonte Nuclear Plant Configuration Recovery Phase 4 Record Update*. This phase of the program was in process at the time of this inspection and was intended to complete the documentation of investment recovery affected equipment and investment recovery collateral damage identified during Phase 3 walk-downs. It was also designed to update the site construction records to account for:

- Plant equipment shipped from the Bellefonte Site to other facilities. These items were tracked using shipping tickets.
- Identify the ECM&D records and update the ECM&D database for the following equipment that was not included in the Phase 2 & 3 scope:
  - System heat trace
  - Instrument sense lines
  - Removed instrument racks
  - Sample lines
  - Acid/Caustic Building
  - Uninstalled instruments in received status

The team reviewed the "Configuration Control Assessment Report" dated July 15, 2009, performed by S&L, in accordance with PI-TVAN-07, which reported the results of comparing construction records to actual component configuration. The assessment involved a total of 157 components; 128 components assessed using a method of selecting a record and then inspecting the component in the field and 29 components were assessed by randomly selecting the component in the field and verifying the records.

The team also reviewed the results of a TVA corporate NA observation concerning the BLN 1&2 Population of the ECM&D Database. During this assessment the NA observer also reviewed the results of the S&L configuration recovery project.

As an independent review of the status of configuration control, the team conducted walkdowns using the S&L updated "red-line" drawings where investment recovery activities had taken place and also in areas of the plant where it was presumed recovery activities did not occur. These walkdowns included the auxiliary feedwater, component cooling water, spent fuel pool cooling, decay heat removal, auxiliary building air conditioning, and high pressure fire protection systems for Unit 1 and Unit 2. While conducting the walk-downs, the team evaluated if the equipment removed for investment recovery had been properly identified. The team compared the condition of components in the field with the P&IDs and the isometric drawings, which had been marked up by S&L personnel during the phase 1 plant status reviews. During this independent review, the team also selected a number of components from each system to determine if the licensee's ECM&D database was in agreement with the observed field conditions for the selected components.

In addition, due to the designation of protecting the QA records vault, the team conducted independent walkdowns on the Raw Service Water (RSW) fire protection water storage tanks, diesel driven fire pumps, and the RSW pumps and power supplies. The walk-down reviewed instrumentation used to automatically start the RSW pumps on low level, physical conditions of the diesel driven fire pumps, fuel oil levels and valve lineups for the RSW and diesel driven fire pumps.

Additional documents reviewed are listed in the attachment.

b. Observations

During the walkdowns the team observed the physical condition of the SSCs. The team identified that TVA had a clear understanding of the need to capture the details surrounding the investment recovery effort as an attempt to validate equipment status affected by the investment recovery effort and to also restore confidence in the ECM&D database. Additionally, TVA identified in the "Bellefonte Nuclear Plant Units 1 & 2 Deferred Status Assessment Report", dated August 4, 2009, that, if construction activities are resumed, multiple programs will be required to fully understand the plant's equipment status, pedigree, and condition necessary to fully evaluate the proper methods of equipment restoration.

During the walkdowns, the team observed the physical condition of the various system's pumps, valves, piping and electrical terminations. The team noted that investment recovery activities included some pump and pump motor removals and that the deliberate cutting of electrical connections, to aid in their removal, was not uncommon. Furthermore, the team's walkdowns identified examples where the investment recovery efforts had additional unknown and detrimental effects on surrounding plant equipment that was not captured by S&L's efforts. These items were placed in the CAP and will be resolved at the appropriate time if construction reactivation occurs.

As part of the walkdown activities, the team performed random samples of drawings referenced by the parent drawing used during the walkdown. The team verified that the references could be retrieved and were appropriately revised. Additionally, if any documents were superseded the team verified that document control had properly identified the referenced drawing as superseded. Individual components, identified during the walkdown, were also verified to ensure their conditions were accurately reflected in the site's ECM&D database.

The licensee's use of the electronic ECM&D database, to define current plant status, has historically been and remains an adequate method for defining project status. Additional methods and data tacking systems were being used in concert with the ECM&D database to attempt to restore confidence to BLN's evaluation of current plant status. BLN was aware that conditions exist within the plant that were not properly reflected in the approved databases and have confidence that, if construction activities resume, additional scoping walkdowns will more accurately reveal plant status. The team identified that the BLN efforts to understand the current plant status were effective but, due to the complexity of any construction project, BLN could not precisely capture the current plant status of the BLN construction status in the ECM&D database.

c. Conclusions

The team concluded that investment recovery activities were primarily isolated to certain areas of the plant and, while some recovery efforts resulted in significant collateral damage, programs are established to capture the overall impact of the salvage activities. In addition, documents used by BLN to identify and record items that were damaged

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and/or removed, during the time period when the QA program was not in effect, appear to be detailed and accurate.

The team concluded that the licensee had a process in place, concerning site procedures applicable to determination of construction status during the expected construction delay, to support transition to deferred plant status, consistent with the Commission Policy Statement.

IV. Maintenance and Preservation (M&P)

M.1.1 M&P Controls (IP 92050)

a. Inspection Scope

Through discussions with licensee personnel and review of procedures and documentation, the team determined that as a result of investment recovery activities without proper QA control, the licensee considers that the condition of all SSCs on site is indeterminate. Therefore, the consideration of safety classification of each individual SSC does not apply. For that reason, preventive maintenance activities were restricted to those activities deemed to be necessary for investment protection. If construction resumes at a later date, TVA plans to individually assess each SSC for overall condition and safety classification. Those SSCs that can be qualified will be reviewed for required PMs, commensurate with the safety classification of the SSC.

The team reviewed the controls established to ensure maintenance activities performed while in a terminated or deferred plant status did not advance construction of the plants. Personnel were interviewed, plan of the day meetings were attended, weekly and daily work schedules were reviewed, and BLN procedures SSP-6.2, "Work Control," Rev. 8, and QCP-10.8, "Temporary Installations or Omissions," Rev. 20 were evaluated.

During the course of this portion of the inspection, the following documents were reviewed:

- Bellefonte DSEP Phase I Design Basis Reconstitution, Engineering Calculations, Unit 1 & 2, October 13, 2009.
- Bellefonte DSEP Phase I Design Basis Reconstitution Program Study, Design Basis Documents, Unit 1 & 2.

Additional documents reviewed are listed in the attachment.

b. Observations

Several thousand active PM activities currently exist at BLN. The PM database was re-created from the previously implemented PM schedule, prior to CP cancellation, and was revised with findings from the S&L investment recovery impact assessment. PM activities were implemented in April 2009 and have been performed weekly by BLN maintenance staff. As PMs were attempted, positive and negative feedback, regarding equipment status and PM performance feasibility, was incorporated into the PM and ECM&D databases to improve the assessment of current plant status. At an approximate performance of 500 PM activities per month, TVA plans to have performed the majority of the expected PM activities by April 2010. Team observation of PM activities indicated that proper controls were established to minimize further degradation of targeted equipment.

The team verified that BLN management approved work orders, daily work activities, and weekly schedules prior to implementation. Additionally, BLN site procedures established controls for work activities performed under a deferred plant status. Specific guidance is provided that prohibits any work that could be identified as furthering plant construction or completion. If the work is questionable, it shall be reviewed by BLN management prior to the start of the effort. If work requires temporary installation of equipment to facilitate operation or PM of equipment, the temporarily installed equipment is identified and tracked in an independent database that will ensure replacement by qualified equipment, if the BLN construction effort is resumed.

c. Conclusions

The team concluded that the licensee has a process in place, concerning site procedures applicable to maintenance and preservation of equipment during the expected construction delay, to support transition to deferred plant status, consistent with the Commission Policy Statement.

M.1.2 M&P Implementation (IP 92050)

a. Inspection Scope

The team reviewed procedures, observed licensee activities, performed facility walkdowns, and interviewed personnel to verify the implementation of TVA's QA program for the Bellefonte site in the area of maintenance and preservation of equipment. The team observed PM activities involving the rotation of EDG building fans, the inspection of the condition of the inert gas (Nitrogen) in the Containment System electrical penetrations, and corrective maintenance removal of groundwater in-leakage into the essential raw cooling water (ERCW) cable tunnel (pipe tunnel). The team reviewed the applicable procedures, documentation, and qualification of the workers conducting the PM and corrective maintenance.

Additionally, the team observed corrective maintenance activities, taken to return the diesel driven fire pumps and RSW pumps to an operational status, for fire protection of plant. This was done to verify the equipment's capability of providing fire protection for the sites lifetime vault. This inspection included a review of the original design basis of the high pressure fire protection system and the impacts of placing certain air operated valves (AOVs) in locked open positions. This also included walk-downs of the main control room to verify RSW pump automatic controls were in appropriate positions and that indications exist that provide pump start on low tank levels.

Employee qualifications were reviewed to determine if the necessary training had been provided to qualify licensee personnel for the conduct the PM activities observed. The training required employees conducting the PM to have read SSP- 9.9, "Preventive Maintenance Long Term Layup."

Additional documents reviewed are listed in the attachment.

b. Observations

Preventive maintenance and walkdown plans and procedures were adequate to identify and minimize degradation of safety related structures. The System Engineer Walkdown procedure called particular attention to those portions of the safety-related structures most susceptible to degradation due to environmental effects. These areas included the primary containment steel liner and portions of the facility prone to ground and rainwater in-leakage. The Bellefonte DSEP Phase I Groundwater In-leakage Assessment contained measures to identify possible degradation due to groundwater in-leakage which occurred after cancellation of the construction permits. PERs 174710 and 201868 had been initiated and contained adequate measures to track the evaluation, correction, and prevention of adverse conditions associated with groundwater in-leakage into the reactor building, auxiliary building, and ERCW pipe tunnel.

The team verified that the employees, who carried out the PM on reactor building electric penetration nitrogen fill, had successfully completed the required training.

The team determined that the current maintenance of the high pressure fire protection system was adequate and that the system could provide protection of plant equipment and assets at BLN.

c. Conclusions

The team concluded that the licensee has a process in place, concerning site procedures applicable to maintenance and preservation of equipment during the expected construction delay, to support transition to deferred plant status, consistent with the Commission Policy Statement.

M.1.3 M&P Storage Activities (IP 92050, 35065)

a. Inspection Scope

The team reviewed procedures and interviewed personnel to verify the implementation of TVA's QA program for the BLN in the areas of housekeeping and storage controls.

The licensee's procedure for housekeeping, SSP-12.7, "Housekeeping/Cleanliness Control," Rev. 7, was reviewed and compared with the commitment requirements of ANSI-N45.2.3-1973, "Housekeeping During the Construction Phase of Nuclear Power Plants." Additionally, to determine the extent in which the licensee conducts their housekeeping tasks, several PERS were reviewed.

To evaluate warehouse, in-place, and in-plant storage conditions and determine whether the requirements of the policy statement were being met, the team performed document reviews and walk-down inspections of warehouse and in-plant storage areas.
The team reviewed SSP-10.3, "Material Storage and Handling," Rev. 9, and PER 168868, Warehouse Storage-Env. Controls. The team also conducted walk-down inspections of Storage Huts HR and HU, as well as various locations within the plant.

Additional documents reviewed are listed in the attachment.

b. Observations

Inventory and environmental controls were terminated following cancellation of the CPs. Level A and B storage area requirements were not met and all indoor storage areas were subsequently classified as Level C by the licensee. Many components and materials were either removed from the site or placed in alternate, integrated storage areas containing safety and non-safety related items, as well as items that were not ready for use. The licensee has classified all components as non-safety related due to its lack of inventory and environmental control. Storage areas were clearly marked indicating that all components within must be evaluated before use in safety-related applications.

The team verified, through walkdown inspections and discussions with licensee personnel, that because housekeeping controls had not been in place during the time the construction permits were cancelled, BLN does not have any areas more restrictive than Zone IV, as described in ANSI N45.2.3-1973. The team was informed that more restrictive housekeeping zones will be established as the licensee conducts individual "hand-over-hand" inspections of SSCs and re-establishes controlled warehousing.

The licensee had initiated PER 168868 to address the storage issues and restore compliance with its material storage and handling procedure SSP-10.3. This PER requires an inventory of all stored items, restoration of Level A and B storage conditions and controls, identification of the appropriate storage level for each item, and evaluation of items for use in safety-related applications. Inventory activities were already underway at the time of the inspection.

c. Conclusions

The team concluded that the licensee has a process in place concerning applicable housekeeping and storage controls during the expected construction delay to support transition to deferred plant status, consistent with the Commission Policy Statement.

V. QA Records

R.1 Procedural Guidance and Record Validation (IP 92050, 35100)

a. Inspection Scope

The team conducted walkdowns of QA record storage facilities and assessed retrieval, access control, quality, storage, and protection of records. The team evaluated BLN's program for retrieval of QA records by requesting copies of various construction and test records and observing staff retrieving records electronically using the enterprise document management (EDM) system.

The team reviewed assessments performed by outside organizations, conducted interviews with staff responsible for records management, and reviewed implementing procedures for document control and QA records to verify that the BLN was operating in accordance with the TVA NQAP. The team evaluated the completeness of procedural instructions and guidance, assessed the staff's knowledge of the procedures, procedure implementation, and TVA plans to improve plant records. The following procedures were reviewed for adequacy:

BLN Procedure SSP-2.9, "Records Management," Rev. 15, defines the requirements and processes for managing records including generation, approval, receipt, transmittal, retention, storage, retrieval, and disposition of records. The procedure also described indexing, and access controls to records.

BLN Procedure SSP-2.3, "Document Control," Rev. 9, included requirements for generation, review, approval, and distribution control of documents.

Additional documents reviewed are listed in the attachment.

b. Observations

The team found, during the records storage facilities walkdown, that the records were stored in one of two vaults located on site. These vaults were classified as the permanent storage facility (lifetime storage) or the construction storage vault. Both facilities had proper environmental controls (temperature and humidity) restored after the lapse in QA programs at BLN following CP withdrawal. The team verified operability and calibration of equipment used for climate control and determined that QA records were protected against damage from temperature and humidity.

Requested QA records were provided to the team in a timely manner. The team observed that access to QA records was controlled and records were adequately maintained in fire resistant structures with adequate smoke and fire suppression systems. The team noted that there was no PM on the fire damper for the permanent QA records vault. The HVAC system for this storage facility is supported by a temporary unit located outside the vault in a hallway. The team determined that the fire damper could be a communicating path should the fire damper fails to close if a fire was to occur in the hallway. PER# 205486 was initiated to evaluate this issue.

The team reviewed assessment # 47-9072951-000 performed by AREVA. One of the areas that was evaluated during this assessment was radiographic films records. This AREVA assessment identified that some degradation was found on a small percentage of the films. The cause of the degradation was attributed to inadequate film processing techniques by the vendor and not caused by the storage conditions in the records vaults. An additional item, from the AREVA assessment, was that items intended to preserve the radiographic films records were missing. During this inspection, the NRC team observed staff interleaving radiography films records with acid free paper, as corrective actions from this AREVA assessment, and determined that the method used to perform this task was in accordance with implementing procedures.

c. Conclusion

The team determined that documents were properly prepared, reviewed, approved, and distributed and that QA records were stored, maintained, and controlled in accordance with the TVA's requirements.

The team concluded that the licensee has a process in place, concerning QA records applicable to equipment during the expected construction activities and delay, to support transition to deferred plant status, consistent with the Commission Policy Statement.

VII. Access Controls

A.1 Procedural Guidance and Program Implementation (IP 92050)

a. Inspection Scope

The team reviewed BLN procedure SSP-11.50, "Bellefonte Security and Plant Access", Rev. 10, and interviewed personnel to verify the implementation of TVA's access control program. While not specifically required by the guidance in the Commission Policy Statement for Deferred Plants, the team recognized the potential effect on BLN "current plant status" if efforts were not in place to minimize unauthorized plant access.

b. Observations

The team verified through witnessing entrance and exit requirements of both personnel and vehicles that security measures were implemented in accordance with prescribed procedures. Additionally, the team witnessed proper implementation of plant access procedures as Security escorted un-badged contract maintenance personnel performing building maintenance at BLN.

c. Conclusions

The team concluded that the licensee has adequate controls established to minimize potential unwanted access to BLN that might adversely and unknowingly affect plant equipment status.

V. Management Meetings

X.1 Exit Meeting Summary

On October 23, 2009, the team presented the inspection results to Mr. Ashok Bhatnagar and other members of his staff. Although some proprietary information may have been reviewed during the inspection, no proprietary information was included in this inspection report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel
Ron Arsenault, Electrical Engineer
Cheryl Auvinen, Doc / Records Management
Glen Camper, Maintenance Foreman
Jim Chardon, Construction, Maintenance and Modifications Manager
Theresa Cheek, NGDC OE / CE Manager
Bob Davis, Plant Support
Alvin Hinson, Engineering Support Manager
Christine Johnson, Corrective Actions Program Administrator
Walter Justice Jr., Site Engineering Manager
Joel Landers, Safety Consultant
Vernon Lee, Maintenance Specialists – PM
John Muir, Operations
Tom Neissen, Nuclear Assurance Manager
Mark Palmer, Project Controls / OPS Manager
Larry Parvin, Corrective Action Program Coordinator
Scott Patterson, Design Engineer
Dan Pratt, Project Engineer
Zack Rad, Bellefonte Licensing Project Manager
Tom Ryan, NGDC Licensing Project Manager
Dan Sanchez, NGDC Training Manager
Andrea Sterdis, NGDC Licensing Manager
Bill Wasylow, Facilities Supervisor
Dale Whitecomb, Licensing Support
Dennis Williams, Operations

Attachment

List of Documents Reviewed

Drawings
3BE1818-CA-01A, "Auxiliary Feedwater System," Rev. 0
35W0606-CS-01, "Condensate System," Rev. 0
3BE0854-NM-01A, "Spent Fuel Pool Cooling," Rev. 0
3BE1856-KC-01A, "Component Cooling System," Rev. 0
3BE1812-ND-01A, "Decay Heat Removal System," Rev. 0
3BE1843-VE-01A, "Auxiliary Building Trained Areas Air Conditioning System," Rev. 0

Procedures
SSP-1.50, "Bellefonte Organization and Responsibilities," Rev 10,
SSP-2.3, "Administration of Site Procedures," Rev 13,
SSP- 2.7, "Document Control", Rev. 9,
SSP- 2.9, "Records Management," Rev.15,
SSP-3.1, "Conduct of Quality Assurance," Rev. 13,
SSP-3.4, "Corrective Action Program," Rev. 6,
SSP-4.5, "Regulatory Reporting Requirements," Rev. 13,
SSP- 6.2, "Work Control," Rev. 8,
SSP-10.3, "Material Storage and Handling," Rev. 9,
SSP-12.7, "Housekeeping/Cleanliness Controls," Rev. 7,
SSP-11.50, "Bellefonte Security and Plant Access," Rev. 10,
BLTI-PREV-09, "System Engineer Walkdowns," Rev. 11,
PI-TVAN-06, Bellefonte Nuclear Plant Configuration Recovery, Rev. 1,
PI-TVAN-07, Bellefonte Nuclear Plant Configuration Control Assessment, Rev. 0,
PI-TVAN-08, Bellefonte Nuclear Plant Configuration Recovery Record/Identification, Rev. 1,
PI-TVAN-09, Bellefonte Nuclear Plant Configuration Recovery Record Update, Rev. 0,
PI-TVAN-10, Bellefonte Nuclear Plant Configuration Recovery Phase 4 Record Update, Rev. 0
NAPD-2, Audits, Rev. 0025, February 18, 2009.

Self-Assessments
BLN-CAP-09-01, "Review of BLN PERs for Trends"
Bellefonte Nuclear Plant Units 1 & 2 Deferred Status Assessment Report, Rev. 0, August 11, 2009
Bellefonte Nuclear Plant Units 1 and 2 Construction Permit and Plant Layup Activities – Audit BLA0901, July 15, 2009
BLN-CAP-09-01 Self Assessment Report - Review of BLN PERs for Trends, August 12, 2009
BLN-CAP-S-09-002 Self Assessment Report - Comparison of the Bellefonte Corrective Action Program to the NPG Corrective Action Process, September 9, 2009
BLN-Site-09-001 Self Assessment Report - BLN Units 1 and 2 Readiness to Return to Deferred Plant Status, June 11, 2009
BLN-Site-09-001A Self Assessment Report – Follow-up On BLN Units 1 and 2 Readiness to Return to Deferred Plant Status, September 28, 2009

PERs Reviewed
168868, Warehouse Storage–Env. Controls
170768, Lack of reportability process
171986, Lighting circuits not per drawings
173729, HP Fire Protection System
173755, Groundwater intrusion
173511, BLN Deferred Status Readiness – Internal Assessment AFI No 1

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173550, BLN Deferred Status Readiness – Internal Assessment AFI No 2
174748, Document control support of upcoming reviews
174750, Plant environment following withdrawal of construction permits
174325, Limited distribution of controlled procedures
174452, Bellefonte security practices
174457, BLN procedures referencing Operating Plant requirements documents
174459, Late approval of BLN corrective action plans
174481, BLN procedure discrepancies
174487, Bellefonte procedure discrepancies
174490, In process work requests documentation
174665, Affected employee clearance training
174674, Operation review of TIO forms
174675, ER specification admin errors
174710, Groundwater In-leakage into Auxiliary Building and Reactor Building
174715, Involvement of ISO in PER 169084 corrective action
174751, Compliance with records management procedure
174752, BLN work control/ service request procedure inconsistencies
174811, Corrective action program
174831, CMTR not yet reviewed
174836, COC typographical error – Auxiliary Feedwater
174858, Record storage – Boyer underground facility
174875, NA audit BLA0901 recommendations
174894, Bellefonte tags plus
175091, Reporting requirements
177443, Fire extinguishers not secured
177446, FME program at BLN
177449, U1 containment roll-up door
177451, Document control environmental controls
177452, Recurrence controls for PER 171986
177453, Fire Protection System availability
177456, Plant security program at BLN
177458, Records vault isolation HVAC dampers
177460, Reg guide tabulation
177462, Permit status
177463, Open condition reports
177465, ECM and D software status
177468, Documentation presentation for deferral effort
177469, CP status communication
177474, Construction permit status
177476, Stellite reduction program
177478, S and L procedure details
200119, U1 V9 Tendon Coupler Failed
201357, Enhancements to SSP-3.4
201868, Water is in the ERCW cable tunnel (pipe tunnel)
202352, Open or breached systems not managed effectively
202411, Employee crossed protective burm in 125V battery room
203644, A safety issue was identified, there appears to be energized 480v conductors exposed

PERs initiated as a result of this inspection
205213, Tagging Practice Inconsistent With NPG Standards
205215, Control of Components

205218, NRC Provided Info With Missing Pages
205281, NRC Identified - Wrong proc ref in BLN project report for Imp of Nuclear QA Prog for BLN U1/U2
205351, Bellefonte has established a practice of using policies
205375, The corrective action plan for PER 173511 was inadequate
205376, Weld damaged on pipe connected to VLV 1-INM-VCAL-79-N
205387, PER 177453 was improperly closed to per action 173511-003 and did not address original problem
205389, NRC identified duplicate use of the term "Service Request"
205390, NRC identified a possible disconnect between responsibilities outlined in SSP-1.50 and SSP-3.1
205396, Cord found in bottom of file cabinet
205397, Cabinet Drawer Locked With No Key
205398, Blanks Found on Records Signature Log
205402, Improper closure of PER 177458
205454, MRC Observation
205458, Use of flagging for barricades is not IAW with the Health & Safety Manual Section 602.
205486, There are currently no PMs on the Fire Dampers for the Permanent QA Records Vault.
205585, NRC Identified difference in nomenclature between Hold Order tag and breaker
205586, NRC Recommendation to evaluate security procedures to address unauthorized intrusion into plant
205589, Inability to provide definitive answer regarding fire damper PM requirements

<u>Miscellaneous</u>
Sargent & Lundy Project No. 12054-006 Rpt. No. 3 of 4, "Bellefonte DSEP Phase I Design Basis Reconstitution Program Study Design Basis Documents Unit 1 & 2", October 13, 2009
Sargent & Lundy Project No. 12054-006 Rpt. No. 1 of 4, "Bellefonte DSEP Phase I Design Configuration Control Engineering Databases and Applications Unit 1 & 2", October 13, 2009
Sargent & Lundy Project No. 12054-006 Rpt. No. 2 of 4, "Bellefonte DSEP Phase I Design Configuration Control Engineering Procedures Unit 1 & 2", October 13, 2009
Sargent & Lundy Project No. 12054-006 Rpt. No. 4 of 4, "Bellefonte DSEP Phase I Engineering Calculations Unit 1 & 2", October 13, 2009
Sargent & Lundy Project No. 12054-012 Rpt. No. 2 of 4, "Bellefonte DSEP Phase I Groundwater In-leakage Assessment Unit 1 & 2", October 13, 2009
DBD-RF, "High Pressure Fire Protection System", Revision 1
System Engineer Walkdowns, BLTI-PREV-09, 2/6/2009
Bellefonte DSEP Phase I Groundwater In-leakage Assessment

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APPENDIX C – RESPONSES TO AGENCY AND PUBLIC COMMENTS

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RESPONSE TO PUBLIC COMMENTS

The draft supplemental environmental impact statement (DSEIS) was available for public review and comment from November 13, 2009 through December 28, 2009. The document was transmitted to state, federal, and local agencies and federally recognized tribes. It was also available on TVA's website for review. Thirty-nine agencies, businesses, organizations, and individuals commented on the DSEIS via mail, email, and verbal statements. In addition, a public meeting was held in Scottsboro, Alabama on December 8, 2010 where the public had the opportunity to ask questions about the DSEIS and submit comments. Forty-nine people registered for the public meeting. This appendix summarizes the public's comments on the DSEIS and TVA's responses to those comments.

Analysis of Comments

Commenters submitted a variety of comments on the DSEIS. The comments were reviewed and arranged into groups with similar concerns. Then, a primary comment statement was prepared for each group of comments. Finally, a response was generated for each comment statement. While many of the commenters supported nuclear power, others voiced general concerns about the use of nuclear power. Many comments focused on the age of existing structures, water quality, reactor design, the safety of nuclear power, air quality, spent fuel, radwaste, alternative sources of energy and conservation, and socioeconomic impacts. Some comments raised concerns about the need and cost of power and cumulative effects.

The individuals, businesses, organizations, and agencies that commented on the DSEIS are listed in Table 1. The table lists each commenter alphabetically and identifies the comment statement or statements attributed to the commenter.

The identifiers for the comment statements are associated with each comment statement in the section immediately preceding the table. The actual letters, e-mails, facsimiles, and transcripts of verbal statements have been included in the administrative record.

Agency Letters

TVA received four letters from state and federal agencies during the 45-day public comment period. The responses to agency comments on the DSEIS follow each letter.

U.S. Environmental Protection Agency — Region IV Atlanta

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

December 11, 2009

Ms. Linda B. Shipp
Senior Manager
NEPA Compliance
Environmental Permitting and Compliance
Office of Environmental Research
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Attn: Ms. Ruth Horton
Senior NEPA Specialist

Subject: EPA's NEPA Review Comments on TVA's DSEIS for the "Single Nuclear Unit at the Bellefonte Plant Site" (November 2009); Jackson County, Alabama

Dear Ms. Shipp:

The U.S. Environmental Protection Agency (EPA) has reviewed the subject Tennessee Valley Authority (TVA) Draft Supplemental Environmental Impact Statement (DSEIS) in accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. TVA has identified an additional need for baseload capacity in the Tennessee Valley for the 2018-2020 timeframe. In response, TVA proposes to either complete or construct and operate one nuclear generating unit at the Bellefonte Nuclear Plant (BLN) brownfield site with a capacity of at least 1,100 MW and up to 1,200 MW, and an expected life cycle of 40 years. BLN is a 1,600-acre peninsular site located on TVA's Guntersville Reservoir in Jackson County Alabama near the town of Hollywood and city of Scottsboro. Three larger cities located within a 50-mile radius of the BLN site are Huntsville and Gadsden, Alabama, and Chattanooga, Tennessee.

EPA environmentally supports TVA's consideration of additional nuclear power in its power mix for the Tennessee Valley if impacts can be minimized and mitigated. Compared to conventional forms of fossil fuels such as pulverized coal, the use of nuclear power reduces overall air emissions – both criteria pollutants and emissions such as carbon dioxide associated with climate change effects. Although nuclear plants may have spent fuel disposal and safety concerns, we give deference to and assume facility safety compliance with the U.S. Nuclear Regulatory Commission (NRC) and TVA requirements and standards. We note that TVA currently operates three nuclear sites in the Valley with two or more reactor units each: Browns Ferry Nuclear Plant (BFN) on the nearby Wheeler Reservoir in Alabama, and the Watts Bar Nuclear Plant (WBN) and

Sequoyah Nuclear Plant (SQN) on the Chicamauga Reservoir in Tennessee. We believe that renewables, clean fossil fuel options and nuclear power will become more and more prominent and eventually replace conventional fossil fuels for power generation.

Background

The TVA Bellefonte site has an extended history. The original TVA license application of 1973 to construct two nuclear reactors at BLN was made to the Atomic Energy Commission, pre-dating the NRC. Filing an application for an operational license followed in 1978. However, with construction for BLN Unit 1 (BLN 1) about 90% complete and for BLN Unit 2 (BLN 2) about 58% complete in the mid-1980s, TVA requested a deferred license status from NRC due to reduced growth forecasts. This deferred status was continued and NRC extended the construction permits to 2011 and 2014 for the two units. In the late 1990s, TVA also issued a "BLN Conversion EIS" to repower Bellefonte from a nuclear facility to a natural gas facility (i.e., combustion turbine plant). EPA provided comments on the DEIS and FEIS in 1997, although conversion construction did not go forward.[1] Subsequently in 2006, TVA submitted a site redress plan and NRC withdrew the construction permits. As part of the TVA redress plan and asset recovery program, unneeded portions of the Bellefonte site "were sold for reuse or abandoned in place" (pg. 4)[2] while others, such as a substation and training center, continued to operate. In response to more favorable power economics since 2005, TVA formally requested re-instatement of the construction permits for BLN 1&2 in 2009. Also, the earlier 2008 COLA ER proposed the Westinghouse AP1000 units BLN 3 and 4 at Bellefonte. On October 19, 2009, NRC conducted a site inspection for the requested deferred status and a response letter to TVA is pending.[3] Of note is that there was a lapse in quality assurance oversight during the period of permit withdrawal through March 2009, a fact that was entered into the Corrective Action Program. EPA01

TVA has not determined whether to complete an existing structure or construct a new structure for the proposed single nuclear generating unit. That is, one of the existing partially completed units could be completed using a Babcock & Wilcox (B&W) pressurized light water reactor technology as BLN 1 or 2, or a new unit could be constructed using a Westinghouse AP1000 (AP1000) advanced pressurized light water reactor technology proposed as BLN 3 or 4 in 2008.

Existing plant structures at BLN include several buildings (two reactor containment, two diesel generator, control, turbine, auxiliary, service and office buildings), a condenser circulating water pumping station, a river intake pumping station, two natural draft cooling towers, a transformer yard, a 500-kV and a 161-kV switchyard,

[1] TVA's interim consideration to convert to a natural gas plant was not documented in the present DSEIS in Section 1.2, but should be noted in the Final SEIS (FSEIS). However, we note that the BLN Conversion EIS was referenced in Section 1.7. BLN 3 and 4 should also be referenced relative to the 2008 Combined License Application Environmental Report (COLA ER). EPA02

[2] The FSEIS should summarize the equipment and structures that were sold and discuss how this might change the Exclusion Area Boundary (EAB) from previous analyses referenced in the DSEIS and whether the previous X/Q and dose calculations are still appropriate or must be re-calculated. EPA03

[3] NRC's findings regarding this site inspection should be disclosed in the FSEIS. EPA01 *cont*

3

a spent nuclear fuel storage pool; sewage treatment facilities, a helicopter pad and railroad spurs. These facilities remain intact but some, such as one of the cooling towers, will need repair or upgrading. Potential work on existing BLN 1 or 2 is facilitated since neither were completed or irradiated when construction ceased.

Reactor Technologies

The DSEIS considers the older B&W and the modern AP1000 reactor technologies as its two nuclear reactor alternatives for the proposed unit at BLN. These alternatives were the *Completion and Operation of a Single B&W Pressurized Light Water Reactor* (Alt. B) or *Construction and Operation of a Westinghouse AP1000 Advanced Pressurized Light Water Reactor* (Alt. C). Alternative B would maximize re-use of the existing, partially-constructed structures at BLN to complete the B&W reactor, i.e., primarily the re-use of one of the two started reactors (BLN 1 or 2). Alternative C would start construction of a new nuclear generation facility using an AP1000 reactor technology (BLN 3 or 4), although some reactor support facilities such as one of the two existing cooling towers could still be re-used.

EPA typically supports the re-use of materials and sites (brownfields/grayfields over greenfields). For the present proposal, re-use would be maximized by Alternative B where BLN 1 or 2 would be completed with the intended B&W reactor design. In this case, however, EPA is concerned that over 20 years have elapsed since construction ceased on BLN 1&2 in the mid-1980s, and that construction designs and materials as well as new inspection standards have significantly changed – especially for development of a nuclear generation unit. EPA04

Beyond the uncertainty of the structural integrity of the partially-completed BLN 1&2, it should be noted that the B&W technology is not as efficient and safe as the AP1000 technology (or equivalent). Compared to the B&W design, the DSEIS documents that an AP1000 reactor uses less radioactive fuel (1,821 fuel assemblies vs. 2,285) over a 40-year life cycle (Table 2-2) and therefore produces less spent fuel for disposal; needs fewer components (Fig. 2-8); has inherent public health safety features in its new "passive" safety design (Sec.2.3) with less potential radiological effects (Sec. 3.17) and design-based accidents (Sec. 3.19); and requires less water intake for cooling with less thermal discharge volumes. EPA05

Purpose & Need

The purpose of the present SEIS is to notify agencies and the public that TVA proposes a major federal action to complete or construct and operate a single nuclear generating unit at BLN, and to document the resultant potential environmental impacts for this unit (pg. S-1). Although TVA may wish to add additional future units at the BLN site, only TVA's NEPA responsibilities for the proposed single BLN nuclear generating unit are covered in the present SEIS. Accordingly, additional TVA NEPA documentation would be needed for additional units at the BNL site (however, if reasonably foreseeable, the cumulative impacts of such additional units should be included in this FSEIS). EPA06

Moreover, we understand from TVA that NRC will subsequently develop its own NEPA document on the licensing process for BLN once TVA determines its selected reactor technology in its Record of Decision (ROD) for the present BLN SEIS.

Alternatives

In addition to the above two nuclear generation alternatives (and the no action), power alternatives requiring or not requiring new generation, site selection alternatives, and transmission alternatives (with the no action) were presented in the DSEIS. Although these alternatives are further described in the enclosed *Detailed Comments*, we offer the following summary comments.

* ***Suitability of Existing BLN Structures***: If Alternative B is selected for the FSEIS, the suitability for re-using existing structures associated with the B&W reactor should be discussed. While EPA typically supports the re-use of materials and sites (brownfields and grayfields over greenfields), we are concerned that over 20 years have elapsed since construction was suspended on BLN 1&2.[4] While we defer nuclear plant safety to TVA and NRC, EPA has documented our re-use construction concerns in the enclosed *Detailed Comments*. EPA07

* ***Reactor Technologies***: The relative environmental and engineering merits of the B&W and AP1000 technologies are compared in the DSEIS. EPA finds that the modern AP1000 technology (or equivalent) is the preferred design for TVA's proposed nuclear generation unit at BLN. EPA prefers this type of AP1000 reactor (Alt. C) over the B&W design (Alt. B) despite the fact that more existing structures at BLN could be used (if found competent) by completing either BLN1 or BLN 2 with the B&W design. EPA08

* ***"Green" Alternatives***: With or without the present nuclear generation project, EPA strongly believes that green alternatives should continue to be promoted by TVA and that the FSEIS should summarize ways in which TVA is promoting such green alternatives, particularly efficiency/conservation and the addition of renewable capacity to support clean conventional baseload options. EPA09 The FSEIS should also discuss how the amount of energy that could be saved or generated by these green alternatives would compare to the identified need and projected 1,100-1,200 MW capacity of the proposed BLN unit. EPA10

* ***Alternate Sites***: TVA screened several existing, brownfield and greenfield sites in its site selection process. We understand that co-location of the proposed nuclear unit at an existing TVA nuclear power station such as BFN may not be advisable due to cumulative thermal discharge issues at the same site and reservoir. Other potential co-locations at WBN and SQN apparently have onsite space conflicts. Former TVA plant sites (e.g., Hartsville Nuclear Plant site) are also not ideal since all or most of the EPA11

[4] Presumably because of new construction standards and other upgrades, the 90% and 58% completion levels for BLN 1&2, respectively, may translate into only a 55% and 35% completion level according to the internet (Wikipedia). The FSEIS should discuss this. EPA12

lands have now been sold to private developers. Finally, development of the Murphy Hill (MH) greenfield site would likely have more environmental impacts than development of the BLN brownfield site, even though MH was already partially graded before a proposed TVA gasification plant at MH was cancelled. Although these site options might be revisited for verification in the FSEIS, we agree that the availability of the BLN brownfield site for development with either Alternative B or C has environmental merit. EPA11 *cont.*

* ***Transmission Upgrades***: If Alternative B (B&W) or C (AP1000) is pursued by TVA, transmission lines and facilities would need to be upgraded through refurbishment (Option 1) or new construction (Option 2) to accommodate the 1,100-1,200 MW of additional electricity. We agree with the selection of Option 1 from an environmental perspective.

* ***FSEIS Conclusions***: In the FSEIS, TVA should confirm or modify its DSEIS preferred alternatives and select a preferred reactor technology. EPA13

Environmental Impacts

Although additional EPA comments are provided in the *Detailed Comments* enclosure, we offer the following summary comments on the environmental impacts of the proposed nuclear generation unit at BLN.

* ***Air Quality*** – One of the advantages of a nuclear power plant is that the criteria pollutants and climate change air emissions associated fossil fuel plants are circumvented or significantly reduced. As discussed in the *Detailed Comments*, our BLN air quality comments are therefore more procedural, relating to meteorological data; dispersion modeling assumptions, procedures, and inputs; use of the new PM 2.5 standard; and further substantiation of some conclusions.

* ***Radiological Effects*** – As indicated previously, EPA prefers the AP1000 reactor design over the B&W technology. One of the reasons for this preference is that the AP1000 is inherently safer than the B&W design due to its advanced passive safety design. EPA14 We have also provided additional comments on radiological effects in the enclosed *Detailed Comments*. These primarily focused on our requests for additional substantiation of provided dose calculations, tritium detection and the storage of spent nuclear fuel.

* ***Waters of the US*** – It appears from the DSEIS that avoidance and minimization of adverse impacts to aquatic resources under the federal Clean Water Act (CWA) Section 404 are being taken into consideration appropriately. That the project would utilize existing structures and transmission corridors, to varying degrees based on alternatives, is a good approach to mitigation as a baseline. Whereas Alternative B (B&W) would not result in the filling of wetlands and Alternative C (AP1000) would impact 12.2 acres, operational safety and modernization considerations associated with the AP1000 design provide adequate justification for pursuing Alternative C if it is otherwise appropriate. Once an alternative is selected and TVA is ready to proceed, a CWA Section 404 permit application should be submitted that characterizes any wetlands and/or stream impacts, EPA15

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EPA15 *cont.*

along with a mitigation plan to address them. Also, since upgrading existing transmission line and facilities (Option 1) is preferred by TVA over new construction, we assume that there would not be any additional wetland impacts associated with project transmission upgrades. EPA16

* ***Surface Water*** – Surface water withdrawals ("make-up water") are needed to account for the proposed nuclear power unit's evaporative losses, cooling tower drift and discharges ("blowdown") to remove solids that accumulate in the cooling water. The Tennessee River (Guntersville Reservoir) would be both the source water for intake withdrawals and receiving waters for downstream discharges via a submerged diffuser (Figs. 3-2 to 3-5).

Although both the B&W and AP1000 technologies would operate in a closed-circuit mode and utilize one of the existing natural draft cooling towers to cool reactor cooling waters, thermal effluent would nevertheless be generated and discharged back into the Guntersville Reservoir receiving waters. Discharge of this heated blowdown is regulated by the State of Alabama National Pollutant Discharge Elimination System (NPDES) permit. This permit also prescribes thermal discharge limits, which are not to exceed a 92°F monthly average, 95°F daily maximum, and 5°F increase over ambient conditions. Hydrothermal modeling (pg. 94) appears to predict that the proposed nuclear unit would not exceed these limits for both Alternatives B and C outside the mixing zone, with the exception of infrequent and unusual hydrologic or meteorological conditions. The FSEIS should clarify and summarize if compliance with all three thermal limits is indeed predicted for both designs and what measures will be taken for compliance during unusual river flows and weather conditions (e.g., generation at less than nameplate capacity or temporary unit shutdown). EPA17

As suggested above, it is noteworthy that the AP1000 technology would require significantly less surface water than the B&W technology – 72% of the B&W withdrawal volume and 36% of the B&W discharge volume (pg. 95). The expected withdrawal rate for the B&W reactor is 34,000 gpm (75 cfs) and discharge rate is 22,650 gpm (50 cfs), while the withdrawal rate for the AP1000 reactor is 23,953 gpm (53 cfs) and discharge rate is 7,914 gpm (18 cfs).[5] Overall, this would result in a lower level of thermal pollution for Guntersville Reservoir, even if both technologies are predicted to comply with NPDES thermal limitations. Such relative differences in efficiency should be considered in TVA's final selection of a preferred reactor technology, particularly if additional units would be added at BLN in the future causing cumulative effects. EPA18

In regard to chemical additives such as biocides and inhibitors added to the cooling waters to control fouling, EPA recommends that the minimum amount of chemical additives be used and that concentrations be monitored. We will defer to the State of Alabama's NPDES permit regarding compliance with water quality standards for discharge effluents, and retain our federal permit oversight. EPA19

[5] Although a minor discrepancy, these "gpm" data suggest a difference of 71% and 35% as opposed to the 72% and 36% stated in the DSEIS. EPA20

* ***Environmental Justice (EJ)*** – U.S. Census data for 2000 for the block group incorporating BLN showed a minority level (percentage) higher than the county average but lower than the state and national averages. Estimates for 2008 showed increases in minorities but with probably similar trends. EPA21 U.S. Census poverty levels for 2000 and 2007 estimates showed a poverty level percent for the BLN area that is below county, state and national levels. EJ evaluations were made in the BLN Conversion EIS (1997) and were referenced (pg. 146). The more recent COLA ER concluded "...that any impacts would be minor and not disproportionate." Moreover, "more recent data" with the same conclusion were also referenced, but not cited. The FSEIS should briefly substantiate these conclusions, rather than only incorporating by reference, and provide citations/timeframes. EPA22 Also, any potential concentrations ("pockets") of minority and/or low-income populations near the BLN site should be identified in the FSEIS. EPA23 It should be noted that a potential EJ impact at BLN would make this site less environmentally preferable to EPA despite being an available brownfield site. EPA24

Regardless of the final EJ conclusion, TVA should provide public outreach on the project to all demographics living near the site during the SEIS process as well as periodic updates thereafter. EPA25

* ***Induced/Secondary/Cumulative Impacts*** – Although TVA has identified a need for additional power by 2018-2020, supplying such power (1,100-1,200 MW) will likely accommodate or induce additional growth in the Tennessee Valley and result in developmental impacts. The FSEIS should acknowledge these expected secondary impacts as a project consequence. EPA26

Regarding cumulative effects, NEPA documents should discuss the past, present and reasonably foreseeable future projects (federal and non-federal) within the project area. This listing should focus on projects that impact the same resources as the proposal, with impacts being qualified and quantified to the extent feasible. In the case of the present BLN proposal, nearby projects with similar impacts (wetland, water quality and radiological impacts) should be emphasized. EPA27

We note that Section 3.13.10 discusses cumulative impacts, albeit only for socioeconomics, while other environmental consequences do not have a cumulative impacts section. This document format is somewhat cumbersome and could be streamlined in the FSEIS by designating only one cumulative impacts section that covers all relevant parameters. EPA28

EPA DSEIS Rating

EPA rates this DSEIS an "EC-2" (Environmental Concerns, additional information requested). We primarily base this rating on the inherent uncertainties associated with a nuclear power unit.

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Summary

EPA supports TVA's consideration of additional nuclear power for the Tennessee Valley due to its reduced air emissions compared to conventional fossil fuel technologies. However, we will defer nuclear plant safety issues to NRC and TVA. For the proposed nuclear generation unit at the Bellefonte site, EPA prefers the AP1000 technology (or equivalent). EPA therefore prefers Alternative C (AP1000) over Alternative B (B&W). However, we also support the use of green alternatives (renewables, efficiency and conservation) if it can be shown that they can provide the identified power need in lieu of the planned nuclear unit, or if not, as a growing supplement to TVA's baseload capacity. Moreover, EPA favors the use of brownfields, grayfields and co-located facilities when feasible and new impacts are not thereby generated. We therefore agree that the availability of the BLN brownfield site for development has environmental merit. Finally, we concur that refurbishing transmission lines and facilities (Option 1) if all current regulatory codes can be met rather than constructing new ones is environmentally appropriate if the BLN project is pursued by TVA. In the FSEIS, TVA should confirm or modify its DSEIS preferred alternatives and select a preferred reactor technology.

Regarding project impacts for the proposed single nuclear unit, the FSEIS should provide additional background information for air quality impacts and radiological effects; EPA29
EPA30 discuss mitigation for BLN impacts to waters of the US (Alt. C); insure compliance with State NPDES thermal limits for heated effluent discharges by either reactor technology (Alts B or C); EPA31 verify minor or no EJ impacts, and revise the cumulative impacts section. EPA32

EPA appreciates the opportunity to review this DSEIS. Should you have questions on our comments, please contact Chris Hoberg of my staff at 404/562-9619 or hoberg.chris@epa.gov for NEPA issues, and Stanley Krivo of the Air, Pesticides and Toxics Management Division at 404/562-9123 or krivo.stanley@epa.gov for air quality technical issues.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

Enclosure: *Detailed Comments*

9

DETAILED COMMENTS

Environmental Impacts

o *Air Quality* – EPA's air quality comments for the DSEIS are as follows:

+ Section 3.16.1.2 Local Meteorology (pg. 160)

* *Meteorological Data (2006-2008)*: The discussion of the updated 2006-2008 meteorological data period does not provide a complete summary of the meteorological conditions. This discussion should be supplemented with tables and figures that provide applicable wind roses, frequency distributions, comparisons, etc. that would provide the reader with a better understanding of the current meteorological conditions. The tables and figures will also allow comparisons with previous observations and long-term records, and a basis for the evaluation of subsequent dispersion and transport analyses. EPA33

* Comparison of *Meteorological Data Records*: The stability class frequency distribution is used to show agreement between different meteorological data records. EPA believes that this is not sufficient to show agreement. The data record comparisons should include joint frequency distributions of stability, wind direction, and wind speed. EPA34

+ Section 3.16.2.1 Dispersion (pg. 162)

* *Section Contents/Title*: This section is concerned with both the dispersion and transport of effluent releases. Therefore, we suggest changing the name to "Transport and Dispersion". EPA35

* *Transport and Dispersion Modeling Procedures*: The atmospheric transport and dispersion modeling procedures, computer model, and input parameters used to develop the provided dispersion estimates should be provided. Explanations may be needed for some of the input parameters (e.g., modeled receptors). An appendix could be used for this information. EPA36

* *Figure of Reactor Plant Layouts*: A figure providing the plant layout, release vents, building heights, and receptor locations, for both the B&W and AP1000 reactor units would be of value in understanding the information provided. We recommend inclusion of such a figure in the FSEIS. EPA37

* *Define Symbols*: The definition and importance of calculated X/Q, X/Q no decay undepleted, X/Q 2.26 day decay undepleted, X/Q 8.0 day decay depleted, and D/Q values provided in Tables 3-14, 15, and 16 should be explained. EPA38

* *Receptor Type and Locations*: The receptors of interest in Tables 3-14 and 3-15 (e.g., nearest cow, garden, goat, etc.) for the B&W reactor appear to be different EPA39

depending on the location of the release. Some of these locations appear to be inside the EAB. An explanation should be provided. EPA39 *cont.*

Table 3-16 has four receptor types at the same location which appears to be within the EAB. This table also has a new column "Maximum Receptor Type Value". The FSEIS should explain these items. EPA40

The reason routine releases (i.e., Tables 3-14, 15 & 16) used the maximum modeled dispersion values while the accidental releases provided in Tables 3-17 and 18 use the 50% probability values should be explained. Because the accident releases are concerned with mostly short-term periods (i.e., less than 24 hours), the maximum values would appear to be appropriate. EPA41

* *Release Boundary*: The "release boundary" used to determine the distance of interest for the accidental release X/Q values should be explained. It appears that the release location used for the previous routine releases could be used. EPA42

+ Section 3.16.3 Affected Environment – Air Quality (pg. 164)

* *Auxiliary Equipment Emissions*: This section does not address the anticipated emissions from the auxiliary equipment except by referencing the 1974 TVA Final Environmental Statement (FES). The FSEIS should include/provide the appropriate emission values and impact assessments for these project emissions. EPA43

* *New PM 2.5 Standard*: This section indicates that the new PM 2.5 24-hour National Ambient Air Quality Standards (NAAQS) was not addressed in previous documents. This new standard should be addressed in evaluating the project PM 2.5 impact in the FSEIS. EPA44

* *PSD Class I Areas*: Class I Areas beyond 100 km should not be eliminated from impact consideration. The need to perform Class I area impact assessment depends on the magnitude of the emissions and the distance to the receptors of concern. EPA45

o ***Radiological Effects*** – We offer the following comments.

+ Section 3.17 Radiological Effects of Normal Operations (pg. 167) – This section indicates recent dose calculations confirm the earlier 1974 assessment for the B&W reactors so the 1974 impacts are applicable for the proposed project. The DSEIS contains no demonstration for this conclusion. The recent dose calculations should be provided along with comparison to the referenced 1974 assessment to demonstrate this conclusion. An appendix could be used to provide this needed documentation. EPA46

+ Section 3.17.3.2 Radiation Doses Due to Gaseous Effluents (pg. 173) – The stated purpose of this section is to revise the inputs and methodologies used in the 1974 FES to use current values representing recent meteorological, population and agricultural data. It also provides gaseous effluent doses for the AP1000 unit. This section should provide EPA47 the modeling procedures, computer model, and input parameters etc. used to develop the provided doses. An appendix could be used for this information. EPA47 *cont.*

+ Section 3.19.1 Design-Basis Accidents (pg. 197) – The purpose of this section is to update the accident dose consequences given in the previous BLN Units 1 and 2 Final Safety Analysis Report (FSAR) (TVA 1991) using atmospheric dispersion values based on current meteorological data and to present corresponding results for the AP1000 unit. The second paragraph on page 199 indicates this was not done directly through re-modeling but by using previously reported doses scaled by 50 percentile X/Q values using the more current meteorological data period. Confirmation is needed that all other parameters used in the dose assessments remain unchanged for the two reactors (e.g., EAD and LPZ distance for each reactor, the Q values, etc.). EPA48

+ Tritium – Undetected levels of tritium in the liquid pathway in the vicinity of some of the currently operating reactors has been an ongoing concern. The levels of tritium released via the liquid pathway annually for either the B&W or AP1000 reactors listed in Tables 3-23 and 3-24, respectively, should be monitored closely and actions levels put in place as these numbers are approached. As an example, for the AP1000, if 50% of the estimated annual release of 1010 C/yr is reached, more frequent environmental monitoring and/or sampling should be conducted. Additionally, if necessary, TVA may need to re-evaluate the operational parameters of the reactor and its associated liquid waste treatment systems. EPA49

Guidelines for the need to increase the frequency of monitoring for tritium based on predetermined action levels should be addressed in the TVA Radiological Environmental Monitoring Program (REMP), if they are not already included. EPA50

+ Spent Fuel Storage – An ongoing, long-term issue is the projected storage of spent nuclear fuel onsite until late in the 21st century, addressed in Section 3.18.2. Although the NRC has determined that this can be done safely for an extended period of time with little risk to the public, it is desirable but not certain that a high-level waste repository will be licensed prior to the need for an onsite spent fuel storage facility in 2036. EPA51

+ Other – The basis and documentation for the dose calculations should be provided. An appendix could be used to provide this information. EPA52

o *Noise* – We offer the following noise comments:

+ Cooling Towers: Page 142 indicates that operational noise generated by the cooling tower is expected to be 48 dBA at the nearest residence (similar to ambient levels) and 54.6 dBA if the tower was operated 24 hours a day. The FSEIS should define the frequency of operation associated with the 48 dBA level and the basis of such an operational timeframe. EPA53

+ Noise Metric: The noise metric used in the DSEIS is unclear. That is, are the provided data in dBA instantaneous or averaged, such as the day-night level (DNL) descriptor? We assume the readings are in DNL but should be clarified in the FSEIS EPA54 (e.g., "48 dBA" could be designated as "48 DNL", "48 dBA DNL", Ldn = 48 dBA, or an introductory sentence indicating that all noise data are expressed in DNL). EPA54 *cont.*

+ Blasting: Blasting may be associated with construction of the AP1000 reactor. The FSEIS should provide additional information on the expected noise levels during blasting at the nearest residence and the frequency of such events. EPA55

+ Residences: Approximately how many residences are located in the proximity of the "nearest residence"? Are homes isolated or clustered? EPA56

Alternatives

In addition to the no action, two nuclear generation alternatives (completion of a B&W reactor or a new AP1000 reactor) were considered for BNL. Both technologies are predicted (pg. 15) to save the public user money in terms of cents per kilowatt (cents//kWh) by 2020 (B&W) or 2023 (AP1000). In addition, alternatives requiring or not requiring new generation, site selection alternatives, and transmission alternatives were considered in the DSEIS. We offer the following.

o ***Nuclear Generation Alternatives:*** Three nuclear generation alternatives were presented.

+ Alternative A (*No Action*) – Under the No Action Alternative, TVA would continue to maintain construction permits for BLN 1&2 in deferred status and not initiate any further site construction at this time.

+ Alternative B (*Completion and Operation of a Single B&W Pressurized Light Water Reactor*) – Alternative B would maximize re-use of the existing, partially-constructed structures at BLN to complete the B&W reactor technology. These primarily include the re-use of one of the two started reactors (BLN 1 or 2), with BLN 1 construction intentionally being about two years further along than BLN 2. Some 400 acres of the 1,600-acre site were disturbed during the initial construction of BLN 1&2.

+ Alternative C (*Construction and Operation of a Westinghouse AP1000 Advanced Pressurized Light Water Reactor*) – Alternative C would start construction of a new nuclear generation facility using an AP1000 reactor technology. An additional 185 acres of the BLN site would need to be cleared. However, several existing structures at the site could still be re-used. These primarily include the re-use of one of the two existing cooling towers; however, they also include reactor supporting structures such as the intake channel and pumping station, blowdown discharge structure, transmission lines and switchyards, barge dock, railroad spur, and meteorological tower.

o ***Alternatives Requiring or Not Requiring New Generation:*** Other alternatives requiring or not requiring new generation capacity were also considered (pp. 46-47). Those alternatives requiring new generating capacity included power generation through coal-fired and natural gas plants as well as renewables. We agree that nuclear power

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would generate less emissions than coal and natural gas and that that renewables are still intermittent, and that such "green" power may need to be purchased by TVA. Moreover, those alternatives not requiring new generation included repowering of existing plants, increasing efficiency and demand side management (energy conservation), and reducing peak demand. TVA concluded that these options were already ongoing and that the addition of nuclear facility at BLN would continue to diversify TVA's energy resources and reduce energy source uncertainties, consistent with TVA's Energy Vision 2020 EIS.

o ***Site Selection Alternatives:*** Regarding the site selection process, several brownfield and greenfield sites were screened. These included co-location with existing TVA nuclear plant sites (BFN, WBN and SQN) which TVA generally found unacceptable because of reservoir thermal issues, the unavailability of some sites due to space or planned changes, and the availability of assets at BLN. In addition to BLN, several brownfield sites in Tennessee were also considered. These were the former Hartsville Nuclear Plant (HVN) site on Old Hickory Reservoir, the former Phipps Bend Nuclear Plant (PBN) site on the Holston River, and the former Yellow Creek Nuclear Plant (YCN) on the Pickwick Reservoir. Although these sites have highway access and prior site characterizations, they have been sold or partially sold and therefore would need to be re-acquired by TVA for power plant development. The considered Murphy Hill (MH) greenfield site on Guntersville Reservoir was a former selected site for a coal gasification plant (1981 TVA FEIS). Although some grading had been done before the project was cancelled, the DSEIS suggested that more impacts can be expected at a greenfield site such as MH than at a brownfield site such as BLN. Although we generally agree, given that the MH site was partially graded, the differences between MH and BLN may not be as significant. However, if BLN 1 or 2 were re-used, there could be a significant benefit to selecting BLN.

o ***Transmission Alternatives:*** With the addition of 1,100-1,200 MW of power, the existing transmission line and stations would need to be upgraded if Alternative B (B&W) or C (AP1000) were implemented. Two action options were screened: Option 1 would upgrade existing facilities while Option 2 would construct new facilities. Since the latter would cost twice the price of the former, only Option 1 was carried forward. Option 1 would re-energize the 500 kV transmission lines and switchyard and would be implemented over the no action if TVA decided to implement Alternative B or C.

EPA Re-Use Recommendations

While EPA typically supports the re-use of materials and sites (brownfields over greenfields), the fact that over 20 years have elapsed since construction ceased on BLN 1&2 in the mid-1980s may be of concern in terms of construction design and material upgrades as well as new inspection standards, especially for a nuclear plant facility. That is, if portions of the partially completed structures for BLN 1 or 2 are to be used for the present project, we offer the following areas of review to help insure construction competence for a nuclear generation unit at BLN:

o ***Building Codes & Inspections*** – The condition of the existing facilities at BLN 1&2 should be inspected. Existing utilities at the two unfinished facilities could include mechanical, plumbing, electrical, and telecommunications equipment and their respective distribution systems. The condition and capacity of existing boilers, chillers, air handlers, duct work, plumbing fixtures, piping, transformers, generators, power panels, and wiring are a few of the items that should be carefully examined to determine if they have any remaining usable life or if they should be replaced, and what costs might be involved. In this regard, it should be noted that NRC's standards for safety requirements may have changed since construction on BLN 1&2 was suspended. EPA57

Similarly, what is the status of Building Code compliance and what code(s) (e.g., International Building Code: IBC) is/are in effect? The existing facilities/structures may require upgrades to render them in full compliance with current building codes. Since building codes are constantly being revised to include more stringent requirements, this could result in significant additional construction costs. The assessment of any Bellefonte structure/facility being considered for re-use should include a complete building code analysis. EPA58

o ***Asbestos*** – EPA has identified numerous construction materials that may contain asbestos (http://www.epa.gov/region4/air/asbestos). Although the use of asbestos containing materials is currently illegal, such materials were used until about 1980. If asbestos is determined to be present in existing BLN 1&2 facilities, abatement may be required for re-use, which may be costly. EPA59

o ***Structural Condition*** – Given that a nuclear generating unit is being proposed, the structural condition of the existing facilities is probably the most important issue. Has a complete structural engineering and safety assessment of the major structures been done, especially for the two partially-built, pressurized water reactors? As suggested above, building codes are frequently upgraded to include more stringent requirements for the structural resistance to natural forces (tornados, earthquakes). NRC has apparently upgraded their seismic design for nuclear power plants (2000) since the Bellefonte plant was first started (http://www.riskeng.com/PDF/New_Seismic.pdf). EPA60

In addition, are there complete construction materials and inspection records of the initial construction available for compliance reviews (compressive strengths, slump tests, reinforcing steel inspections, welding records, etc.)? Were "as-built drawings" prepared after construction? EPA61

Has there been any measured subsidence or settlement of the structures/facilities? EPA62

Other structural-related considerations include infestations, roofing integrity and pavement structures. Regarding infestations, do the structures have a history of water infiltration, either through roof leaks or at window and door openings? Are any structures affected by mold and/or termites? Similarly, the structural integrity of roofs is also important. Although roofing integrity may be sound, it is critical to assess the weather-tight integrity of the finished roofing system and materials, including its age, repair history, and its replacement cost. Any needed roofing replacement or repair costs should be addressed as part of the project's development costs. Finally, regarding EPA63 pavements and hard stand areas, an analysis of all flexible, rigid and special pavement types should be performed, with remaining life determinations made. EPA63 *cont.*

o ***Weather/Climate Events*** – As suggested above, tornados, earthquakes and other weather/climate events since the mid-1980s could be important in determining the re-use suitability of BNL 1&2. The BNL site is located in an F-3/F-4/F-5 tornado alley, according to http://upload.wikimedia.org/wikipedia/commons/3/35/Tornado_Alley.gif. EPA64

Moreover, in April of 2003, this area[6] experienced an earthquake of a 4.9 Rickter Scale magnitude. Did this event result in any structural damage at the BLN facilities? EPA65

Similarly, did the recent flooding events in the summer of 2009 cause Guntersville Reservoir to flood at Bellefonte and cause structural damages for the existing facilities? EPA66

Also, does the current site design and layout meet requirements for capture and treatment of onsite storwmwater? We note (pg. 37) that structures on the "nuclear island" portion of the BLN site are designed to withstand "...hurricanes floods, tornados and earthquakes without loss of capability to perform safety functions." EPA67

o ***Impact Analysis*** – Were the existing facilities designed and constructed to survive the impacts of large commercial aircraft? Advances in power station designs have occurred since the 9-11 terrorism event. Will the partially-built facilities to contain the pressurized water reactor meet (or can they be modified to meet) the current standards for this? Also see: http://www.nrc.gov/reading-rm/doc-collections/news/2007/07-127.html. EPA68

Other Comments

o ***NEPA Process*** – Because of the new BLN site development plan, the large number of supporting documents containing important basic information/analyses, and the more than 3.5 decades over which these reference document have been developed, a stand-alone complete SEIS containing all pertinent information and backup analyses appears to be appropriate for this project. The present DSEIS for the current single nuclear reactor configuration does not provide the information and supporting documentation needed for a complete understanding and evaluation by licensing agencies and the general public. In lieu of a complete stand-alone SEIS, the FSEIS should provide the specific document, section, and page where referenced documentation/analyses can be obtained to support the information provided. If appropriate, the specific NRC docket website location should also be provided. EPA69

o ***Benzene*** – On page 97, the molluscicide entry includes this description: "a nitrogen atom with four attachments, some or all of which can be benzene-based, rather than hydrocarbon-based." Since benzene is a hydrocarbon, this statement should be revisited for the FSEIS. EPA70

o ***Terminology*** – The name of Alternative C is somewhat inconsistent in the DSEIS. Typically, it is listed (e.g., pg. 36) as *Construction and Operation of a Westinghouse AP1000 Advanced Pressurized Light Water Reactor*. However, the technology is also referred to (pg. 188) as the *Westinghouse Advanced Passive pressurized water reactor* EPA71

[6] The earthquake epicenter was located some 37 miles southwest of Chattanooga, TN (internet).

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(AP1000). Although the FSEIS should clarify, we assume that the AP1000 design is an "advanced passive safety" system. EPA71 *cont.*

o ***Table 1-3*** – The information provide in this table (***Environmental Reviews and Documents Pertinent to Bellefonte Nuclear Plant Unit 1***: pg. 19) is not limited to Unit 1. Therefore, "Unit 1"should be removed from the title. EPA72

o ***Figures*** – Assumed Figure 2-1 is not numbered in the DSEIS. Also, we suggest that Figures 3-2, 3-3, and 3-4 label the identified "submerged diffuser" area as the plant discharge site for clarity, as was done in Figure 3-5. EPA73

EPA01. On October 19, 2009, NRC conducted a site inspection for the requested deferred status and a response letter to TVA is pending. NRC's findings regarding this site inspection should be disclosed in the FSEIS.

> *Response:* The December 2, 2009 NRC Inspection Report has been included as the Final Supplemental Environmental Impact Statement (FSEIS) Appendix B. The inspection concluded that TVA has established the necessary programs to support transition to deferred status, consistent with the Commission Policy Statement for Deferred Plants. By letter dated January 14, 2010, the U.S. Nuclear Regulatory Commission (NRC) authorized placement of BLN Units 1 and 2, into 'deferred plant' status (see Appendix A). FSEIS 1.2.2 has been revised to include additional information about the inspection and its findings as well as the NRC's authorization to place Bellefonte Units 1 and 2 into 'deferred plant' status.

EPA02. TVA's interim consideration to convert to a natural gas plant was not documented in the present DSEIS in Section 1.2, but should be noted in the Final SEIS (FSEIS). However, we note that the BLN Conversion EIS was referenced in Section 1.7. BLN 3 and 4 should also be referenced relative to the 2008 Combined License Application Environmental Report (COLA ER).

> *Response:* TVA's 1997 FEIS for the Bellefonte conversion process was briefly described and incorporated by reference in DSEIS 1.7 and documented in Table 1-3. The FSEIS 1.2.2 has been revised to further document the consideration to convert Bellefonte to a natural gas plant in 1997. The 2008 COLA ER is discussed in FSEIS 1.2.3 and is listed in Table 1-3.

EPA03. The FSEIS should summarize the equipment and structures that were sold as part of the TVA redress plan and asset recovery program, and discuss how this might change the Exclusion Area Boundary (EAB) from previous analyses referenced in the DSEIS and whether the previous X/Q and dose calculations are still appropriate or must be re-calculated.

> *Response:* FSEIS 2.2.3 summarizes the equipment sold by TVA as part of the investment recovery program. The Unit 1 and 2 atmospheric dispersion (χ/Q) values have been revised based on current meteorological data (see FSEIS 3.16) and the current Exclusion Area Boundary. The dose calculations were revised based on these revised χ/Q values and releases from the Units 1 & 2 Final Safety Analysis Report (FSAR). Equipment and structures that were sold as part of the TVA redress plan and asset recovery program is to be replaced to maintain conformance with the original Unit 1 and 2 design. Replacement of any Unit 1 or 2 plant equipment, which was previously sold as part of the redress plan and asset recovery program, will not impact the EAB, χ/Q calculations, or dose calculations.

EPA04. EPA is concerned that over 20 years have elapsed since construction ceased on BLN 1&2 in the mid-1980s, and that construction designs and materials as well as new inspection standards have significantly changed - especially for development of a nuclear generation unit.

> *Response:* FSEIS 2.2.2, 2.2.3, and 2.7.1 have been updated to include detailed information regarding the condition of existing structures, and facilities, including remaining usable life and compliance with NRC standards and consideration of building codes.

EPA05. Beyond the uncertainty of the structural integrity of the partially-completed BLN 1 &2, it should be noted that the B&W technology is not as efficient and safe as the AP1000 technology (or equivalent). Compared to the B&W design, the DSEIS documents that an AP 1000 reactor uses less radioactive fuel (1,821 fuel assemblies vs. 2,285) over a 40-year life cycle (Table 2-2) and therefore produces less spent fuel for disposal; needs fewer components (Fig. 2-8); has inherent public health safety features in its new "passive" safety design (Sec.2.3) with less potential radiological effects (Sec. 3.17) and design based accidents (Sec. 3.19); and requires less water intake for cooling with less thermal discharge volumes.

> *Response:* FSEIS 2.2, 2.3, 2.7, Tables 2-2, and 3-3 have been revised to clarify the differences between the two technologies.

EPA06. Although TVA may wish to add additional future units at the BLN site, only TVA's NEPA responsibilities for the proposed single BLN nuclear generation unit are covered in the present SEIS. Accordingly, additional TVA NEPA documentation would be needed for additional units at the BLN site (however, if reasonably foreseeable, the cumulative impacts of such additional units should be included in this FSEIS).

> *Response:* TVA is not proposing to add nuclear units beyond Watts Bar Unit 2 and the proposed single unit at Bellefonte. The Integrated Resource Planning process currently underway will provide a roadmap for meeting future power needs beyond those addressed by the current proposal. While nuclear power is expected to be a component of TVAs future plans, it would be speculative at this time to say that TVA might build additional nuclear units at the Bellefonte site.
>
> Two-unit construction and operation at the Bellefonte site is addressed in the original TVA/NRC environmental reports, the environmental assessment and the construction permit for the B&W plant, and also in the combined license application for the AP1000 plant. Based on these earlier reports, TVA can project that should one or more units be added in the future, additional site disturbance would be minimal outside of the 606 acre project area. Operational impacts would increase, but not double, as there are some shared systems, particularly with the B&W units. Because both units would use closed cycle cooling systems, additional surface water impacts would be small. In general surface water, air quality, radiological, and many other effects would be regulated under permits issued by state and federal agencies and the plants would be operated in compliance with permits to minimize environmental effects.

EPA07. If Alternative B is selected for the FSEIS, the suitability for re-using existing structures associated with the B&W reactor should be discussed. While EPA typically supports the re-use of materials and sites (brownfields and grayfields over greenfields), we are concerned that over 20 years have elapsed since construction was suspended on BLN 1&2. While we defer nuclear plant safety to TVA and NRC, EPA has documented our re-use construction concerns in the enclosed *Detailed Comments*.

Response: See response to EPA04.

EPA08. EPA finds that the modern AP1000 technology (or equivalent) is the preferred design for TVA's proposed nuclear generation unit at BLN. EPA prefers this type of AP1000 reactor (Alt. C) over the B&W design (Alt. B) despite the fact that more existing structures at BLN could be used (if found competent) by completing either BLN 1 or BLN 2 with the B&W design.

Response: Comment noted.

EPA09. With or without the present nuclear generation project, EPA strongly believes that green alternatives should continue to be promoted by TVA and that the FSEIS should summarize ways in which TVA is promoting such green alternatives, particularly efficiency/conservation and the addition of renewable capacity to support clean conventional baseload options.

Response: The contribution of energy efficiency and demand response (EEDR) programs and the generation of electricity from renewable resources are more fully addressed in FSEIS 1.4 and 2.4.

Currently TVA is actively pursuing renewable generation capacity through our Green Power Switch and Generation Partners programs and has recently added approximately 1,300 MWs of wind resources to its energy portfolio through several power purchase agreements. TVA currently provides incentives to customers through the Energy Right and Generation Partners programs.

TVA recognizes that EEDR programs play an important part in meeting our energy needs. The demand reduction and energy savings associated with EEDR programs have been included in our updated need for power analysis in FSEIS 1.4.

TVA anticipates using a mix of resources, including EEDR programs, renewable resources, natural gas-fired generation, and nuclear generation to provide the additional future needs. Given the magnitude of the capacity and energy need, and to avoid the risk of relying on only one fuel or technology, no single resource should be used to meet all of the future energy and capacity requirements. TVA has determined that adding a nuclear unit at the BLN site is the most cost effective alternative to meet a portion of these future needs.

EPA10. The FSEIS should discuss how the amount of energy that could be saved or generated by these green alternatives would compare to the identified need and projected 1,100-1,200 MW capacity of the proposed BLN unit.

Response: See response to EPA09.

EPA11. TVA screened several existing, brownfield and greenfield sites in its site selection process. We understand that co-location of the proposed nuclear unit at an existing TVA nuclear power station such as BFN may not be advisable due to cumulative thermal discharge issues at the same site and reservoir. Other potential co-locations at WBN and SQN apparently have onsite space conflicts. Former TVA plant sites (e.g., Hartsville Nuclear Plant site) are also not ideal since all or most of the lands have now been sold to private developers. Finally, development of the Murphy Hill (MH) greenfield site would likely have more environmental impacts than development of the BLN brownfield site, even though MH was already partially graded before a proposed TVA gasification plant at MH was cancelled. Although these site options might be revisited for verification in the FSEIS, we agree that the availability of the BLN brownfield site for development with either Alternative B or C has environmental merit.

Response: Comment noted.

EPA12. Presumably because of new construction standards and other upgrades, the 90% and 58% completion levels for BLN 1&2, respectively, may translate into only a 55% and 35% completion level according to the internet (Wikipedia). The FSEIS should discuss this.

Response: FSEIS 2.2.2 and 2.2.3 have been revised to address the completion status of Unit 1 and Unit 2 and the activities required to complete a unit.

EPA13. In the FSEIS, TVA should confirm or modify its DSEIS preferred alternatives and select a preferred reactor technology.

Response: FSEIS 2.9 identifies TVA's preferred alternative as the completion and operation of Bellefonte Unit 1, a B&W unit.

EPA14. As indicated previously, EPA prefers the AP1000 reactor design over the B&W technology. One of the reasons for this preference is that the AP1000 is inherently safer then the B&W design due to its advanced passive safety design.

Response: FSEIS 2.7.2 has been revised to clarify that both designs would meet all NRC safety requirements. The AP1000 design is different, but not safer.

EPA15. It appears from the DSEIS that avoidance and minimization of adverse impacts to aquatic resources under the federal Clean Water Act (CWA) Section 404 are being taken into consideration appropriately. That the project would utilize existing structures and transmission corridors, to varying degrees based on alternatives, is a good approach to mitigation as a baseline. Whereas Alternative B (B&W) would not result in the filling of wetlands and Alternative C (AP1000) would impact 12.2 acres, operational safety and modernization considerations associated with the AP1000 design provide adequate justification for pursuing Alternative C if it is otherwise appropriate. Once an alternative is selected and TVA is ready to proceed, a CWA Section 404 permit application should be submitted that characterizes any wetlands and/or stream impacts, along with a mitigation plan to address them.

Response: If the selected alternative involves any activity that results in the discharge of dredge or fill material into the waters of the U.S, TVA would apply for a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers. The permit would address wetland and stream impacts by requiring mitigation measures to compensate for those impacts.

EPA16. Also, since upgrading existing transmission line and facilities (Option 1) is preferred by TVA over new construction, we assume that there would not be any additional wetland impacts associated with project transmission upgrades.

Response: Because the transmission line corridors proposed for upgrade are already existing and no new or wider rights-of-way are proposed, no additional impacts to wetlands are anticipated under any generation action alternative. The only impacts to wetlands would be those associated with reenergizing, refurbishing and upgrading the lines, and with regular right-of-way maintenance activities. Any wetland areas located within existing corridors may experience vegetation clearing and/or vehicular traffic. All best management practices (e.g. dry season work, pressure reducing tires, mats, aquatic approved herbicides) would be implemented to minimize wetland impacts in existing rights-of-way.

EPA17. Although both the B&W and AP1000 technologies would operate in a closed-circuit mode and utilize one of the existing natural draft cooling towers to cool reactor cooling waters, thermal effluent would nevertheless be generated and discharged back into the Guntersville Reservoir receiving waters. Discharge of this heated blowdown is regulated by the State of Alabama National Pollutant Discharge Elimination System (NPDES) permit. This permit also prescribes thermal discharge limits, which are not to exceed a 92°F monthly average, 95°F daily maximum, and 5°F increase over ambient conditions. Hydrothermal modeling (pg. 94) appears to predict that the proposed nuclear unit would not exceed these limits for both Alternatives B and C outside the mixing zone, with the exception of infrequent and unusual hydrologic or meteorological conditions. The FSEIS should clarify and summarize if compliance with all three thermal limits is indeed predicted for both designs and what measures will be taken for compliance during unusual river flows and weather conditions (e.g., generation at less than nameplate capacity or temporary unit shutdown).

Response: If TVA selects and completes Alternative B (B&W reactor) or Alternative C (AP 1000 reactor), procedures for the operation and maintenance of the plant will include processes to monitor all National Pollutant Discharge Elimination System (NPDES) thermal limits and implement changes in the operation of the plant to maintain compliance with these limits. If required, curtailing power generation at the plant (i.e., derating) would be used to prevent a violation of the NPDES permit limits, as emphasized on page 92 and page 94 of DSEIS 3.1.3.1. Derating has been successfully implemented to maintain compliance at several TVA thermal plants in Alabama, including Widows Creek Fossil Plant, Colbert Fossil Plant, and Browns Ferry Nuclear Plant. TVA will implement processes to maintain compliance with the NPDES limits at Bellefonte for all possible operating conditions of the plant, including unusual river flows and weather conditions (FSEIS 3.1.3).

EPA18. As suggested above, it is noteworthy that the AP1000 technology would require significantly less surface water than the B&W technology – 72% of the B&W withdrawal volume and 36% of the B&W discharge volume (pg. 95). The expected withdrawal rate for the B&W reactor is 34,000 gpm (75 cfs) and discharge rate is 22,650 gpm (50 cfs), while the withdrawal rate for the AP1000 reactor is 23,953 gpm (53 cfs) and discharge rate is 7,914 gpm (18 cfs). Overall, this would result in a lower level of thermal pollution for Guntersville Reservoir, even if both technologies are predicted to comply with NPDES thermal limitations. Such relative differences in efficiency should be considered in TVA's final selection of a preferred reactor technology, particularly if additional units would be added at BLN in the future causing cumulative impacts.

Response: The use of closed-loop cooling system under both technologies would result in a water withdrawal rate that is a small percent (0.2 percent or less) of the annual average river flow of Guntersville Reservoir. For example, the minimum daily average flow out of Chickamauga Dam (located upstream) is 1,350,000 gallons per minute (gpm). The daily average flow through Guntersville Reservoir will be about the same. TVA has revised FSEIS 2.7.2 and 3.1.2, replaced DSEIS Tables 3-3 and 3-4 with FSEIS Table 3-3, and added Table 2-5 to clarify the comparison of both technologies. A comparison of thermal efficiencies for both technologies has been added to FSEIS 2.7.2 and Table 2-2.

EPA19. In regard to chemical additives such as biocides and inhibitors added to the cooling waters to control fouling, EPA recommends that the minimum amount of chemical additives be used and that concentrations be monitored. We will defer to the State of Alabama's NPDES permit regarding compliance with water quality standards for discharge effluents, and retain our federal permit oversight.

Response: As provided in the BLN site NPDES permit (AL0024635), should TVA select Alternative B or C, TVA would implement best industry practices to minimize the amount of chemical additives used. Concentrations of additives would be routinely monitored.

EPA20. Although a minor discrepancy, these "gpm" data suggest a difference of 71% and 35 % as proposed to the 72% and 36% stated in the DSEIS.

Response: See response to EPA18.

EPA21. U.S. Census data for 2000 for the block group incorporating BLN showed a minority level (percentage) higher than the county average but lower than the state and national averages. Estimates for 2008 showed increases in minorities but with probably similar trends.

Response: FSEIS 3.13.3.1 has been revised to include further discussion about impacts to minority and low-income populations based on additional information provided to NRC in 2008. The 'more recent data' mentioned in FSEIS 3.13.3.2 is discussed in FSEIS 3.13.3.1. This has been clarified in the FSEIS. These data may be cited as <http://www.census.gov/hhes/www/poverty/poverty.html>.

EPA22. U.S. Census poverty levels for 2000 and 2007 estimates showed a poverty level percent for the BLN area that is below county, state and national levels. EJ evaluations were made in the BLN Conversion EIS (1997) and were referenced (pg. 146). The more recent COLA ER concluded "...that any impacts would be minor and not disproportionate." Moreover, ",more recent data" with the same conclusions were also referenced, but not cited. The FSEIS should briefly substantiate these conclusions, rather than only incorporating by reference, and provide citations/timeframes.

> *Response:* See response to EPA21.

EPA23. Also, any potential concentrations ("pockets") of minority and/or low-income populations near the BLN site should be identified in the FSEIS.

> *Response:* FSEIS 3.13.3.1 has been updated to include concentrations of minority and/or low-income populations near the BLN site.

EPA24. It should be noted that a potential EJ impact at BLN would make this site less environmentally preferable to EPA despite being an available brownfield site.

> *Response:* Comment noted.

EPA25. Regardless of the final EJ conclusion, TVA should provide public outreach on the project to all demographics living near the site during the SEIS process as well as periodic updates thereafter.

> *Response:* FSEIS 1.6.2 describes the public outreach for the DSEIS including notice of availability, newspaper ads, TVA's webpage, and a public meeting. Should TVA select one of the action alternatives, ongoing communications would be established with those living in areas affected by plant construction to ensure the public is informed about the construction process and that TVA is aware of public questions and concerns. Outreach will be designed to reach all demographics.

EPA26. Although TVA has identified a need for additional power by 2018-2020, supplying such power (1,100-1,200 MW) will likely accommodate or induce additional growth in the Tennessee Valley and result in developmental impacts. The FSEIS should acknowledge these expected secondary impacts as a project consequence.

> *Response:* While not addressed in the Socioeconomics section, an overview of the growth in power needs that TVA anticipates and is planning for is discussed in FSEIS 1.4, in particular in 1.4.1. TVA is responding to the forecasted need for power and does not agree that it is "inducing" growth by doing do. TVA does agree that the reliability of the energy TVA's system provides and is known for can be a consideration when companies assess where to locate new facilities. Trying to assess the impacts from that would involve substantial speculation. Any cumulative effects from future proposals to use the BLN site can and would be assessed when such proposals occur.

EPA27. Regarding cumulative effects, NEPA documents should discuss the past, present, and reasonably forseeable future projects (federal and non-federal) within the project area. This listing should focus on projects that impact the same resources as the proposal, with impacts being qualified and quantified to the extent feasible. In the case of the present BLN proposal, nearby projects with similar impacts (wetland, water quality and radiological impacts) should be emphasized.

Response: The SEIS considers cumulative effects on a resource by resource basis. The analysis for each resource takes into account current background conditions, which reflect the effects of past and present projects. Where applicable, the resource-specific analysis considers the impact of reasonably foreseeable future projects. FSEIS 3.13.11 references information from Section 4.7 of the COLA ER (TVA 2008), which indentifies the Redstone Arsenal realignment project as the only major federal project in the 50-mile area that could contribute to cumulative socioeconomic effects. Redstone Arsenal is nearly 50 miles from Bellefonte and the construction period for that project is not expected to overlap with the proposed Bellefonte project. Both the Bellefonte and the Redstone projects would provide longterm economic benefit to the area. Updated information about nonfederal projects planned for the area has been added to FSEIS 3.13.11. Most of the projects identified would be completed before projected construction workforce buildup at the Bellefonte site and none were thought to contribute to cumulative effects during operation. Cumulative effects of TVA's Widows Creek fossil plant on water and air quality are discussed in FSEIS 3.1.3 and 3.16.2.

EPA28. We note that Section 3.13.10 discusses cumulative impacts, albeit only for socioeconomics, while other environmental consequences do not have a cumulative impacts section. This document format is somewhat cumbersome and could be streamlined in the FSEIS by designating only one cumulative impacts section that covers all relevant parameters.

Response: Comment noted. TVA has chosen to address cumulative effects on a resource by resource basis. A statement regarding how cumulative effects are addressed in the FSEIS has added to the introduction to FSEIS 3.0.

EPA29. ...the FSEIS should provide additional background information for air quality impacts and radiological effects;

Response: FSEIS 3.16.2 and 3.17 have been revised to include additional information about air quality impacts and radiological effects.

EPA30. ...discuss mitigation for BLN impacts to waters of the US (Alt C);

Response: FSEIS 3.4.2 discusses the potential purchase of credits from a wetland mitigation bank within the same watershed to compensate for wetland impacts resulting from selecting Alternative C. If Alternative C is selected, implementation of that alternative will generate more specific details regarding proposed mitigation methods and compensation ratios required by the U.S. Army Corps of Engineers under the Clean Water Act Section 404 permit for all wetland impacts associated with this alternative.

EPA31. ...insure compliance with State NPDES thermal limits for heated effluent discharges by either reactor technology (Alts B or C).

Response: TVA will comply with the thermal limit requirements of the applicable NPDES permit. As indicated in FSEIS 3.1.3.2, modeling results indicate that NPDES thermal limits (i.e., discharge temperatures not to exceed limits of 92°F monthly average, 95°F daily maximum, or 5°F increase over ambient conditions) will be met under most river flow and meteorological conditions. On rare and infrequent occasions, measures up to, and including, plant derates would be taken to prevent a violation of the NPDES permit. Monitoring would be conducted to confirm compliance with the NPDES thermal limits.

EPA32. ...verify minor or no EJ impacts, and revise the cumulative impacts section.

Response: See response to EPA21.

EPA33. The discussion of the updated 2006-2008 meteorological data period does not provide a complete summary of the meteorological conditions. This discussion should be supplemented with tables and figures that provide applicable wind roses, frequency distributions, comparisons, etc. that would provide the reader with a better understanding of the current meteorological conditions. The tables and figures will also allow comparisons with previous observations and long-term records, and a basis for the evaluation of subsequent dispersion and transport analyses.

Response: The 2006-2008 meteorological data has been added to the FSEIS. The following is included in Appendix I:

- Composite wind rose (all stability classes).
- Occurrence of stability classes (percent of total hours).
- Wind direction distribution (percent of total hours).
- Wind speed distribution (percent of total hours).
- Joint frequency distribution tables for each stability class (A-G) and all stability classes combined.

EPA34. The stability class frequency distribution is used to show agreement between different meteorological data records. EPA believes that this is not sufficient to show agreement. The data record comparisons should include joint frequency distributions of stability, wind direction, and wind speed.

Response: Appendix J, which compares the different data periods (1979-1982, 2006-2007 COLA, and 2006-2008 Full), has been added to the FSEIS. Tables list the percent of occurrence for wind direction, wind speed and, stability class during each data period. Graphs are provided to display the data for direct comparison. The differences between the three data periods are within the normal year-to-year variation for Bellefonte.

EPA35. Section 3.16.2.1 Dispersion (pg. 162). This section is concerned with both the dispersion and transport of effluent releases. Therefore, we suggest changing the name to "Transport and Dispersion".

> *Response:* Section 3.16 has been reorganized in the FSEIS to better match the structure of other sections in Chapter 3. The discussion of atmospheric dispersion can now be found in subsection 3.16.1 Climatology and Meteorology, Environmental Consequences. This subsection includes both routine and accidental releases.

EPA36. The atmospheric transport and dispersion modeling procedures, computer model, and input parameters used to develop the provided dispersion estimates should be provided. Explanations may be needed for some of the input parameters (e.g., modeled receptors). An appendix could be used for this information.

> *Response:* The requested information has been added to FSEIS 3.16.1.2, Routine Releases.

EPA37. A figure providing the plant layout, release vents, building heights, and receptor locations, for both the B&W and AP1000 reactor units would be of value in understanding the information provided. We recommend inclusion of such a figure in the FSEIS.

> *Response:* The site layout for the B&W and AP1000 reactor units are shown in FSEIS Figures 2-1 and 2-12 respectively. Figures providing the release vents, building heights, and receptor locations, for both the B&W and AP1000 reactor units, have been added to FSEIS 3.16.1.2.

EPA38. The definition and importance of calculated X/Q, X/Q no decay undepleted, X/Q 2.26 day decay undepleted, X/Q 8.0 day decay depleted, and D/Q values provided in Tables 3-14, 15, and 16 should be explained.

> *Response:* This information has been added to FSEIS 3.16.1.2, Environmental Consequences, Routine Releases.

EPA39. The receptors of interest in Tables 3-14 and 3-15 (e.g., nearest cow, garden, goat, etc.) for the B&W reactor appear to be different depending on the location of the release. Some of these locations appear to be inside the EAB. An explanation should be provided.

> *Response:* The distances and directions from the release point to the receptor location will be different for different release points. A discussion of the selection of receptor locations and Figure 3-21 showing the receptor locations for the B&W reactor has been added to FSEIS 3.16.1.2.

EPA40. Table 3-16 has receptor types at the same location which appears to be within the EAB. This table also has a new column "Maximum Receptor Type Value." The FSEIS should explain these items.

> *Response:* Additional information has been provided in FSEIS 3.16.1.2, to clarify the receptor locations within the EAB.

EPA41. The reason routine releases (i.e., Tables 3-14, 15 & 16) used the maximum modeled dispersion values while the accidental releases provided in Tables 3-17 and 18 use the 50% probability values should be explained. Because the accident releases are concerned with mostly short-term periods (i.e., less than 24 hours), the maximum values would appear to be appropriate.

Response: As stated in FSEIS 3.16.1.2, 50 percent probability short-term accident χ/Q values were determined to provide more realistic doses in accordance with NRC Regulatory Guide 1.145. This means that the resulting χ/Q values could be exceeded half of the time. In contrast, the design basis analyses in the FSAR are required to use more conservative 95th percentile χ/Q values meaning that the values would be exceeded only 5 percent of the time. The normal effluent release χ/Qs given in FSEIS Tables 3-14, 3-15, and 3-16 are based on annual averages. Therefore, they do not represent any probability percentile. However, for normal effluent releases, the highest χ/Qs were determined from all of the offsite locations to provide conservative maximum individual doses.

EPA42. The "release boundary" used to determine the distance of interest for the accidental release χ/Q values should be explained. It appears that the release location used for the previous routine releases should be used.

Response: Additional information has been added to FSEIS 3.16.1.2 to explain the basis for the release boundary surrounding the potential release locations.

EPA43. Section 3.16.3 Affected Environment – Air Quality (pg. 164). This section does not address the anticipated emissions from the auxiliary equipment except by referencing the 1974 TVA Final Environmental Statement (FES). The FSEIS should include/provide the appropriate emission values and impact assessments for these project emissions.

Response: According to TVA's 1974 Final Environmental Statement (FES), the oil-fired auxiliary steam generators would, at peak load, release sulfur oxides to the atmosphere from a 125-ft stack at a rate of almost 143 pounds per hour (lb/hr) or 18 grams per second (gm/sec). The maximum SO_2 concentration was calculated to be 0.12ppm. This peak would occur quite close to the plant stack and decrease quite rapidly with distance. At the time of the 1974 FES, the State of Alabama SO_2 standard was 0.15ppm for a 24-hour average. The current EPA National Ambient Air Quality Standards (NAAQS) for SO_2 is 0.14ppm for a 24-hour average. The 1974 FES concluded that the SO_2 releases from the oil-fired auxiliary steam generators were acceptable. Even with the slightly lower NAAQS, these releases are acceptable. The auxiliary boilers have since been sold and various options for their replacement are being considered, including an electric boiler which would have no emissions. The AP1000 utilizes an electric boiler in place of an oil fired boiler; therefore no emissions will occur from the auxiliary boiler with Alternative C. Operational activities, emissions and impacts related to Alternative C would be roughly equivalent to or less than those under Alternative B. FSEIS 3.16.3 has been revised to include this information.

EPA44. Section 3.16.3 Affected Environment – Air Quality (pg. 164). This section indicates that the new PM 2.5 24-hour National Ambient Air Quality Standards (NAAQS) was not addressed in previous documents. This new standard should be addressed in evaluating the project PM 2.5 impact in the FSEIS.

> *Response:* TVA addressed the $PM_{2.5}$ NAAQS in the DSEIS on page 164. $PM_{2.5}$ non-attainment designations were also addressed in the COLA ER. Both the standard and the non-attainment designations were referenced and updated for this SEIS. This information can be found in FSEIS 3.16.2.1.

EPA45. Class I Areas beyond 100 km should not be eliminated from impact consideration. The need to perform Class I area impact assessments depends on the magnitude of the emissions and the distance to the receptors of concern.

> *Response:* Typically, Class 1 areas are identified within a 100-km radius of the site; however, TVA identified and considered the two nearest Class 1 areas even though they fell outside this radius. TVA's analysis determined that emissions related to the action alternatives B or C would be controlled to meet current applicable regulatory requirements such that resulting impacts would be minor and would not adversely affect these Class 1 areas. Therefore, areas located further away than these Class 1 areas would also experience no adverse impact.

EPA46. Section 3.17 Radiological Effects of Normal Operations (pg. 167) – This section indicates recent dose calculations confirm the earlier 1974 assessment for the B&W reactors so the 1974 impacts are applicable for the proposed project. The DSEIS contains no demonstration for this conclusion. The recent dose calculations should be provided along with comparison to the referenced 1974 assessment to demonstrate this conclusion. An appendix could be used to provide this needed documentation.

> *Response:* The conclusions of the 1974 assessment demonstrated that the doses are within the more recently established 10 CFR Part 50 Appendix I limits (1977a), and the new analyses calculated independently also confirms that the doses are within these limits. The 1974 assessment is discussed for informational and historical purposes only. All conclusions presented in this section are based on their respective analyses presented in FSEIS 3.17.

EPA47. Section 3.17.3.2 Radiation Doses Due to Gaseous Effluents (pg. 173) – the stated purpose of this section is to revise the inputs and methodologies used in the 1974 FES to use current values representing recent meteorological, population and agricultural data. It also provides gaseous effluent doses for the AP1000 unit. This section should provide the modeling procedures, computer model, input parameters etc. used to develop the provided doses. An appendix could be used for this information.

> *Response:* The requested information has been added to FSEIS 3.17.2.

EPA48. Section 3.19.1 Design-Basis Accidents (pg. 197) - The purpose of this section is to update the accident dose consequences given in the previous BLN Units 1 and 2 Final Safety Analysis Report (FSAR) (TVA 1991) using atmospheric dispersion values based on current meteorological data and to present corresponding results for the AP 1000 unit. The second paragraph on page 199 indicates this was not done directly through re-modeling but by using previously reported doses scaled by 50 percentile X/Q values using the more current meteorological data period. Confirmation is needed that all other parameters used in the dose assessments remain unchanged for the two reactors (e.g., EAD and LPZ distance for each reactor, the Q values, etc.).

> *Response:* The following statement has been added to FSEIS 3.19.1.1, evaluation methodology: 'All other input parameters and assumptions used for the accident analyses remain unchanged from the BLN Units 1&2 FSAR and BLN COLA FSAR.'

EPA49. Undetected levels of tritium in the liquid pathway in the vicinity of some of the currently operating reactors has been an ongoing concern. The levels of tritium released via the liquid pathway annually for either the B&W or AP1000 reactors listed in Tables 3-23 and 3-24, respectively, should be monitored closely and actions levels put in place as these numbers are approached. As an example, for the AP1000, if 50% of the estimated annual release of 1010 C/yr is reached, more frequent environmental monitoring and/or sampling should be conducted. Additionally, if necessary, TVA may need to re-evalutate the operational parameters of the reactor and its associated liquid waste treatment systems.

> *Response:* The radiological environmental monitoring program (REMP) conducted for the BLN site will be designed based on the regulatory guidance from NRC Regulatory Guide 4.1 and NUREG 1301/1302. The sampling will include the collection of water samples from the Tennessee River downstream from the site at a minimum of two locations using automatic composite samplers. These samplers will be designed to collect a sample at least once every two hours. The resulting composite sample will be analyzed monthly. The process that is currently applied in the REMP monitoring conducted for TVA's existing nuclear sites is to collect and analyze samples for the composite samplers more frequently if elevated activity levels are identified or suspected in samples from any of the REMP monitoring locations. This process would be applied to the BLN REMP.

EPA50. Guidelines for the need to increase the frequency of monitoring for tritium based on predetermined action levels should be addressed in the TVA Radiological Environmental Monitoring Program (REMP), if they are not already included.

> *Response:* See response to EPA49.

EPA51. An ongoing, long-term issue is the projected storage of spent fuel onsite until late in the 21st century, addressed in Section 3.18.2. Although the NRC has determined that this can be done safely for an extended period of time with little risk to the public, it is desirable but not certain that a high-level waste repository will be licensed prior to the need for an on-site spent fuel storage facility in 2036.

> *Response:* The U.S. Department of Energy (DOE) is responsible for the disposal of all high-level radioactive waste generated from TVA's nuclear reactors, as well as the transportation of radioactive materials to the disposal facility. TVA plans to provide dry cask storage of radioactive materials in an on-site independent spent

fuel storage installation (ISFSI) at BLN, in addition to the storage capacity of the spent fuel pool for either a B&W reactor or an AP1000 reactor, until a licensed repository or interim offsite storage option becomes available (10 CFR 51.23). A discussion of spent fuel storage is contained in FSEIS 3.18.2.

EPA52. The basis and documentation for the dose calculations should be provided. An appendix could be used to provide this information.

Response: See response to EPA47.

EPA53. Page 142 indicates that operational noise generated by the cooling tower is ecpected to be 48 dBA at the nearest residence (similar to ambient levels) and 54.6 dBA if the tower was operated 24 hours a day. The FSEIS should define the frequency of operation associated with the 48 dBA level and the basis for such an operational timeframe.

Response: The cooling towers will operate 24 hours a day, 7 days a week. The only time that they will not operate is during refueling outages.

EPA54. The noise metric used in the DSEIS is unclear. That is, are the provided data in dBA instantaneous or averaged, such as the day-night level (BNL) descriptor? We assume the readings are in DNL but should be clarified in the FSEIS (e.g., "48 dBA" could be designated as "48 DNL", "48 dBA DNL", Ldn = 48 dBA, or an introductory sentence indicating that all noise data are expressed in DNL).

Response: The metric used is the day-night average noise level, which is abbreviated as either Ldn or DNL.

EPA55. Blasting may be associated with construction of the AP1000 reactor. The FSEIS should provide additional information on the expected noise levels during blasting at the nearest residence and the frequency of such events.

Response: Peak instantaneous A-weighted noise levels from blasting are predicted to be 75 dBA at the source and approximately 40 dBA at the nearest residence. Blasting is expected to occur intermittently over the course of one year, though there would likely be several weeks when blasting would occur daily. When blasting does occur, there would likely be two or three detonations per day, each lasting less than one second. FSEIS 3.12.2 has been updated to include this information.

EPA56. Approximately how many residences are located in the proximity of the "nearest residence"? Are homes isolated or clustered?

Response: There are approximately 50 cabins, second homes and primary residences located along the north shore of Town Creek embayment in the Creeks Edge Development. The homes most likely to be impacted by noise are clustered in the southwestern portion of the development (see Figure 3-15). This information has been added to FSEIS 3.12.2.

EPA57. The condition of the existing facilities at BLN 1&2 should be inspected. Existing utilities at the two unfinished facilities could include mechanical, plumbing, electrical, and telecommunications equipment and their respective distribution systems. The condition and capacity of existing boilers, chillers, air handlers, duct work, plumbing fixtures, piping, transformers, generators, power panels, and wiring are a few of the items that should be carefilly examined to determine if they have any remaining usable life or if they should be replaced, and what costs might be involved. In this regard, it should be noted that NRC's standards for safety requirements may have changed since construction on BLN 1 &2 was suspended.

Response: See response to EPA04.

EPA58. Similarly, what is the status of Building Code compliance and what code(s) (e.g., International Building Code: IBC) is/are in effect? The existing facilities/structures may require upgrades to render them in full compliance with current building codes. Since building codes are constantly being revised to include more stringent requirements, this could result in significant additional construction costs. The assessment of any Bellefonte structure/facility being considered for re-use should include a complete building code analysis.

Response: See response to EPA04. As a federal agency, TVA is not subject to building codes but it does consider them.

EPA59. EPA has identified numerous construction materials that may contain asbestos (http://www.epa.gov/region4/air/asbestos). Although the use of asbestos containing materials is currently illegal, such materials were used until about 1980. If asbestos is determined to be present in existing BLN 1&2 facilities, abatement may be required for re-use, which may be costly.

Response: DSEIS 3.14.1 stated that asbestos materials have been used in the construction of BLN Units 1&2 facilities. Several roll-offs of asbestos waste generated from the repair and upkeep of the plant buildings have been disposed of in the past three years. These materials were removed by appropriately certified personnel, and disposed of in an ADEM-approved landfill. Should TVA select one of the action alternatives, it is expected that this process will continue, as needed, during plant construction.

EPA60. Given that a nuclear generating unit is being proposed, the structural condition of the existing facilities is probably the most important issue. Has a complete structural engineering and safety assessment of the major structures been done, especially for the two partially-built, pressurized water reactors? As suggested above, building codes are frequently upgraded to include more stringent requirements for the structural resistance to natural forces (tornados, earthquakes). NRC has apparently upgraded their seismic design for nuclear power plants (2000) since the Bellefonte plant was first started (<http://www.riskeng.com/PDF/New_Seismic.pdf>).

Response: See response to EPA04.

EPA61. In addition, are there complete construction materials and inspection records of the initial construction available for compliance reviews (compressive strengths, slump tests, reinforcing steel inspections, welding records, etc.)? Were "as-built drawings" prepared after construction?

> *Response:* FSEIS 2.2.3 has been revised to include information on the status of quality assurance records and as-constructed drawings.

EPA62. Has there been any measured subsidence or settlement of the structures/facilities?

> *Response:* There has been no observed subsidence or settlement of the structures/facilities. FSEIS 2.2.3 has been updated to address the issue of subsidence or settlement of structures/facilities.

EPA63. Other structural-related considerations include infestations, roofing integrity and pavement structures. Regarding infestations, do the structures have a history of water infiltration, either through roof leaks or at window and door openings? Are any structures affected by mold and/or termites? Similarly, the structural integrity of roofs is also important. Although roofing integrity may be sound, it is critical to assess the weather-tight integrity of the finished roofing system and materials, includingeits age, repair history, and its replacement cost. Any needed roofing replacement or repair costs should be addressed as part of the project's development costs. Finally, regarding pavements and hard stand areas, an analysis of all flexible, rigid and special pavement types should be performed, with remaining life determinations made.

> *Response:* See response to EPA04.

EPA64. As suggested above, tornados, earthquakes and other weather/climate events since the mid-1980s could be important in determining the re-use suitability of BLN 1&2. The BLN site is located in an F-3/F-4/F-5 tornado alley, according to http://upload.wikimedia.org/wikipedia/commons/3/35/Tornado_Alley.gif.

> *Response:* FSEIS 3.16.1.1 has been updated to include weather events since 1980. The tornadoes listed on the Huntsville National Weather Service web site for 1980-2008 were identified and are listed in Appendix K. During 1980-2008, 17 tornadoes occurred in Jackson County, including 2 storms with a strength of F4(Fujita scale)/EF-4 (Enhanced Fujita scale). Of these tornadoes, 7 (including 1 EF-4 tornado) had tracks (all or part) within 10 miles of the BLN site. The F/EF Class for each tornado is listed and tornadoes with tracks within 10 miles of Bellefonte are identified. Numerous other significant weather events were identified for Jackson County during 1980-2008 on the National Climatic Data Center (NCDC) Storm Events web site. The quantity of each of these events is listed. No impacts to existing plant structures resulted from these events.

EPA65. Moreover, in April of 2003, this area experienced an earthquake of a 4.9 Rickter Scale magnitude. Did this event result in any structural damage at the BLN facilities?

> *Response:* No, the April 29, 2003 earthquake that occurred near Fort Payne, Alabama did not cause any damage, structural or otherwise, to BLN facilities. According to the U.S. Geological Survey's community internet intensity map, the shaking intensity at BLN was in the IV (light) to V (moderate) range. At these

intensity levels the vibration, similar to the passing of heavy trucks, effects include the rattling of windows, dishes, and doors; small unstable objects displaced or upset; doors swing, close, open are typically noticed ; and could be felt both indoors and outside enough to waken sleepers. No structural damage would be expected at these intensity levels.

EPA66. Similarly, did the recent flooding events in the summer of 2009 cause Guntersville Reservoir to flood at Bellefonte and cause structural damages for the existing facilities?

Response: Based on observed data at Guntersville Dam and the South Pittsburg gage at Tennessee River mile 418.1, the highest reservoir elevation between May and September 2009 occurred in early May and was less than a two-year flood at both locations. Therefore, there was no flood damage at the BLN site.

EPA67. Also, does the current site design and layout requirements for capture and treatment of onsite storm water? We note (pg. 37) that structures on the "nuclear island" portion of the BLN site are designed to withstand ". . .hurricanes floods, tornados and earthquakes without loss of capability to perform safety functions."

Response: The capture and treatment of stormwater for the current site design and layout is managed through NPDES permit, AL0024635. Any future construction will meet applicable NPDES requirements. The current permit is active from December 1, 2009 through November 30, 2014.

EPA68. Were the existing facilities designed and constructed to survive the impacts of large commercial aircraft? Advances in power station designs have occurred since the 9-11 terrorism event. Will the partially-built facilities to contain the pressurized water reactor meet (or can they be modified to meet) the current standards for this? Also see: http://www.nrc.gov/reading-rm/doc-collections/news/2007/07-127.html.

Response: The Category 1 structures that contain the pressurized water reactor are complete, with minor modifications necessary to meet new regulatory requirements. Security requirements for nuclear power plants have been significantly upgraded since September 11, 2001, including the development of contingency plans to address beyond design basis events. The B&W plant design will meet applicable licensing requirements and regulations including those regarding aircraft impact.

EPA69. Because of the new BLN site development plan, the large number of supporting documents containing important basic information/analyses, and the more than 3.5 decades over which these reference document have been developed, a stand-alone complete SEIS containing all pertinent information and backup analyses appears to by appropriate for this project. The present DSEIS for the current single nuclear reactor configuration does not provide the information and supporting documentation needed for a complete understanding and evaluation by licensing agencies and the general public. In lieu of a complete stand-alone SEIS, the FSEIS should provide the specifc document, section, and page where referenced documentation/analyses can be obtained to support the information provided. If appropriate, the specific NRC docket website location should also be provided.

Response: The FSEIS strives to include specific citations for all reference documents. Many of the key documents are posted on TVA's web-site for easy access by readers. In response to EPA's comment, we've reviewed the DSEIS for complete and accurate citations. Where they were missing, complete citations have been added to the FSEIS.

EPA70. On page 97, the molluscicide entry includes this description: "a nitrogen atom with four attachments, some or all of which can be benzene-based, rather than hydrocarbon-based." Since benzene is a hydrocarbon, this statement should be revisited for the FSEIS.

Response: The molluscicide entry has been corrected in FSEIS 3.1.4.1.

EPA71. The name of Alternative C is somewhat inconsistent in the DSEIS. Typically, it is listed (e.g., pg. 36) as "Construction and Operation of a Westinghouse AP1000 Advanced Pressurized Light Water Reactor." However, the technology is also referred to (pg. 188) as the "Westinghouse Advanced Passive Pressurized Water Reactor (AP1000)." Although the FEIS should clarify, we assume that the AP1000 design is an "advanced passive safety" system.

Response: This inconsistency has been corrected in the FSEIS.

EPA72. Table 1-3 - The information provided in this table ("Environmental Reviews and Documents Pertinent to Bellefonte Nuclear Plant Unit 1:" pg 19) is not limited to Unit 1. Therefore, "Unit 1" should be removed from the title.

Response: The title of Table 1-3 has been corrected in the FSEIS.

EPA73. Assumed Figure 2-1 is not numbered in the DSEIS. Also, we suggest that Figures 3-2, 3-3, and 3-4 label the identified "submerged diffuser" area as the plant discharge site for clarity, as was done in Figure 3-5.

Response: Figure 2-1 is labeled in the FSEIS and is listed in the Table of Contents. The suggested revision has been made to FSEIS Figures 3-3, 3-4 and 3-5.

U.S. Department of Interior

12/21/2009 11:44:32 AM TVA PAC site ID #64

The Department of the Interior has reviewed the draft EIS and have no comments to provide for your consideration. I can be reached at 404-331-4524 or by email at gregory_hogue@ios.doi.gov. DOI01

Gregory Hogue
Regional Environmental Officer
Office of Environmental Policy and Compliance
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Contact: email

DOI01. The Department of the Interior has reviewed the draft EIS and have no comments to provide for your consideration.

Response: Comment noted.

State of Alabama — Alabama Historical Commission

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 South Perry Street
Montgomery, Alabama 36130-0900

Frank W. White
Executive Director

Tel. 334-242-3184
Fax 334-240-3477

November 24, 2009

Ruth M, Horton
TVA
400 West Summit Hill Drive
Knoxville, Tennessee 37902

Re: AHC 09-1092
Supplemental Environmental Impact Statement
Bellefonte Facility
Jackson, Limestone, & Morgan Counties, Alabama

Dear Ms. Horton:

Upon review of the SEIS submitted by your office, we have determined that we agree with the findings in the report. Fort the facility, we agree that archaeological site 1Ja311 should be avoided. We also agree that the Bellefonte Cemetery and the African American Bellefonte Cemetery should be avoided and some vegetative screening should be utilized here. SHPOAL01 Furthermore, for the transmission lines, we agree with your consulting with our office on the scope of work when it becomes available to ensure cultural resources are identified and dealt with according to eligibility. SHPOAL02

We appreciate your efforts on this project. Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/GCR/gcr

RECEIVED DEC 14 2009

The State Historic Preservation Office
www.preserveala.org

SHPOAL01. Fort [sic] the facility, we agree that archaeological site lja311 should be avoided. We also agree that the Bellefonte Cemetery and the African American Bellefonte Cemetary should be avoided and some vegetative screening should be utilized here.

Response: Comment noted.

SHPOAL02. Futhermore, for the transmission lines, we agree with your consulting with our office on the scope of work when it becomes available to ensure cultural resources are identified and dealt with according to eligibility.

Response: Comment noted. TVA will continue to consult with the Alabama Historical Commission regarding the scope of work for the transmission lines associated with the Bellefonte Plant.

Georgia Department of Natural Resources — Historic Preservation Division

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION

CHRIS CLARK
COMMISSIONER

DR. DAVID CRASS
ACTING DIVISION DIRECTOR

December 9, 2009

Ruth M. Horton
Senior NEPA Specialist
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, Tennessee 37902
rmhorton@tva.gov

RE: **Upgrade Bellefonte Nuclear Transmission Lines**
Dade County, Georgia
HP-090914-001

Dear Ms. Horton:

The Historic Preservation Division (HPD) has reviewed the *Draft Supplemental Environmental Impact Statement, Single Nuclear Unit at the Bellefonte Plant Site, Jackson County, Alabama*, dated November 2009 and prepared by the Tennessee Valley Authority (TVA). Our comments are offered to assist TVA in complying with the provisions of Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

Based on the information provided, HPD understands that if the Transmission Action Alternative is selected, then TVA will consult with our office and conduct a cultural resource survey to identify historic properties in the project's area of potential effects. SHPOGA01

For future submittals, please note our new address below. We look forward to reviewing the additional information as it becomes available. Please refer to project number **HP-090914-001** in any future correspondence regarding this undertaking. If we may be of further assistance, please do not hesitate to contact me at (404) 651-6624.

Sincerely,

Elizabeth Shirk

Elizabeth Shirk
Environmental Review Coordinator

ES: jht

cc: Dan Latham, Jr., Northwest RC

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SHPOGA01. Based on the information provided, HPD understands that if the Transmission Action Alternative is selected, then TVA will consult with our office and conduct a cultural resource survey to identify historic properties in the project's area of potential effects.

Response: Comment noted. TVA will continue to consult with the Georgia Department of Natural Resources - Historic Preservation Division regarding the scope of work for the transmission lines associated with the Bellefonte Plant.

Public Comments

General

1. We incorporate by reference Blue Ridge Environmental Defense League's (BREDL) previous recommendations on TVA's Integrated Resource Management Plan.

> *Response:* Comments relevant to this SEIS contained in BREDL's August 14, 2009 letter to TVA regarding the scoping of the IRP have been responded to in Appendix C.

2. TVA's main goal is to be guardians over the TVA Watershed area, which includes providing energy plus protecting our environment while protecting the welfare of its stakeholders.

> *Response:* Comment noted.

3. TVA has neglected one of their primary missions, environmental stewardship.

> *Response:* Comment noted. For more information about TVA's environmental stewardship programs, activities and goals, go to the TVA environmental stewardship webpage <http://www.tva.gov/environment>.

4. Since TVA got into the power generation business, its mission has been to increase use of electricity to spur economic development. Neither TVA nor its distributors have the ability to transform themselves into a modern electricity system that sees energy efficiency as an energy resource that will save money, create jobs, and benefit everyone.

> *Response:* Comment noted. The FSEIS has been modified to include more information about energy efficiency (EE), including the addition of an Energy Efficiency/Demand Response (EEDR) program to the base case and all alternatives, and the analysis of an enhanced, more aggressive EE effort on the Bellefonte B&W alternative.

5. The dedication of water supply to nuclear power plants is wasteful and contrary to the principal purposes for which the Tennessee Valley Authority was created -- river navigability, flood control and agricultural and industrial development.

> *Response:* The expected BLN withdrawal is about 35,000 gallons per minute (gpm; with 23,000 gpm being returned to the river) and 24,000 gpm (with 8,000 gpm being returned to the river), for the B&W and the AP1000 alternatives, respectively. These expected BLN withdrawals are approximately 0.2 percent and 0.1 percent, respectively, of the average flow through Guntersville Reservoir (see FSEIS Table 3-3). River navigability, flood control and agricultural and industrial development would not be impacted by these small water withdrawals.

6. TVA and its distributors make money strictly on how much power they sell and how much they can recover in increased rates from the capital investments of building new generation sources. The single largest barrier to unrolling energy efficiency in our region is how to ensure that the TVA and its distributors can cover their costs as power sales decline.

> *Response:* Comment noted. FSEIS 1.4 shows the reduction in power sales due to energy efficiency programs, and the annual cost of power taking into account the cost of the programs as well as the power sales decline.

7. TVA deferred investment in base load generation, which increased the cost of electricity to many municipal and cooperative utilities by up to 75 percent, to prepare for competition that never came. With the restart of Browns Ferry Unit 1 and the completion of Watts Bar Unit 2, TVA is working to close the gap in base load generation that was caused by their tepid reaction to pending competition forecast by the industry during the mid-1990s.

> *Response:* Comment noted.

8. The TVA has carried forth a community propaganda campaign which has not presented accurate risks of nuclear power or employment statistics.

> *Response:* TVA provides information that is based on verifiable data when available or based on best available estimates when making forecasts. FSEIS 3.0 provides information on nuclear plant safety in FSEIS 3.19, 'Nuclear Plant Safety and Security' and on employment statistics in FSEIS 3.13, 'Socioeconomics.'

9. What has TVA spent totally on all costs (including insurance and interest) related to the failed attempt to build two nuclear reactors at the Bellefonte site? How much does TVA still owe on this debt?

> *Response:* TVA has spent approximately $4.6 billion on the partial construction of Bellefonte Units 1 and 2. TVA has been addressing these costs over the years. In July 2005, TVA's Board of Directors approved amortizing the remaining costs, $3.9 billion, and collecting them in rates over ten years beginning with fiscal year 2006. While TVA seeks to maximize the use of existing assets and thereby avoid some of the capital costs associated with constructing an entirely new facility, TVA had already addressed the amortization and recovery of the Bellefonte sunk costs before the current consideration of completing one of the unfinished Bellefonte units. Costs such as insurance and interest on debt are part of the cost of doing business and generally are not allocated to individual projects. Investments in power production facilities are a liability only if left unfinished. Once a power plant is brought online, the resulting revenue stream will provide a return on the investment.

10. The mismanagement of the nuclear program has resulted in the TVA Debt.

> *Response:* Some of TVA's current debt can be attributed to the past nuclear programs. TVA spent approximately $4.6 billion on the partial construction of Bellefonte Units 1 and 2. Investments in power production facilities are a liability only if left unfinished. Once a power plant is brought online, the resulting revenue stream will provide a return on the investment.

11. TVA's lack of honesty to the public after the Kingston and Widows Creek Disasters does not give citizens a sense of security and trust.

Response: TVA works to ensure public trust by providing information to the public about any incident as quickly and accurately as possible, and information is updated as new information becomes available.

The NEPA Process

12. TVA's analysis of energy efficiency and renewable energy as potential alternatives to the proposed new nuclear reactor is inadequate to fulfill NEPA's requirements to vigorously explore and objectively evaluate all reasonable alternatives. TVA has not released any analysis that would support its contention that these resources do not merit full consideration. Energy efficiency and renewable energy alternatives should be given full consideration as reasonable alternatives under NEPA.

Response: FSEIS 2.4 has been revised to include a more robust discussion of the potential for EEDR and renewable resources either alone or in combination with energy storage technologies.

TVA has reviewed the most recently published studies on energy efficiency identified by comment providers (Brown, M and J A Laitner, et al, "Energy Efficiency in Appalachia: How Much More is Available and at What Cost, and by When?" Appalachian Regional Commission, March 2009; Chandler, S and M A Brown, "Meta-Review of Efficiency Potential Studies and Their Implications for the South," Georgia Tech Ivan Allen College School of Public Policy, Working Paper #51, August 2009) as well as reports published since the close of the comment period (Brown, M A et al, "Energy Efficiency in the South," Southeast Energy Efficiency Alliance, April 12, 2010). These studies estimate the potential of EE to effectively add capacity to power systems–through energy savings–to replace or delay the construction of new generating plants through 2020 and/or 2030. For comparative purposes, TVA also reviewed a study by the Electric Power Research Institute that forecasted energy efficiency potential in southern U.S. states ("Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S. (2010-2030)," Electric Power Research Institute, Technical Report 1016987, January 2009).

The FSEIS has been updated to include an EEDR program that reduces energy needs by about 5,200 GWhs in the 2018-2020 time period. The average annual reduction for this program is about 0.3 percent through 2020. This is about 55 percent of the moderate achievable estimate of 0.5 percent annual reduction through 2020 by the Meta-Review study and about the 70 percent of the realistic achievable estimate of 0.4 percent for southern states by EPRI. An Enhanced EEDR program which about doubles the reduction in energy use of the base case EEDR program in the 2018-2020 time period has also been developed and analyzed. The TVA Enhanced EEDR program averages 0.6 percent reduction per year through 2020. This is approximately 55-75 percent of the maximum achievable estimates of 1 percent by the Meta-Review study, 0.9 percent for southern states by EPRI, 0.7 percent for Appalachia by the ARC, and 0.9 percent by the Energy Efficiency in the South study (see FSEIS 2.4).

The Need for Power analysis in FSEIS 1.4 shows that in the base case EEDR program, the proposed nuclear unit plus additional gas and nuclear expansion units are needed to meet the forecasted demand for power. Analysis of the Enhanced EEDR program shows that even with substantial energy replacement through conservation measures, TVA must still add new generation in the 2018-2020 time frame to balance resources with the projected load requirements. TVA needs both EEDR and new base load generation to meet projected demand. If EEDR efforts are more successful than predicted, TVA will be able to consider this in future energy resource analyses, including consideration of new resources and the retirement of existing resources, such as older coal-fired generating units.

FSEIS 2.4 discusses in more detail the merits of renewable energy sources such as wind and solar. Both of these resources have significantly greater land footprints and associated environmental impacts compared to the proposed nuclear unit. Additionally, to provide generation profiles similar to a nuclear unit, they must be coupled with energy storage capacity which would increase the land requirement to compensate for additional efficiency losses or with fossil-fueled generation which would increase air quality impacts. Biomass as a renewable fuel can be used to provide high capacity factor power provided adequate fuel supply exists; however, the air quality impacts are higher than a nuclear unit. Hydroelectric power has been concluded to be less environmentally preferable given its low capacity factors, environmental impacts, and the limited availability of feasible new sites in the TVA territory.

13. TVA's analysis does not offer any substantive consideration of the significant risks associated with building a nuclear reactor, such as the uncertainty in the timeline to license and construct a new reactor and costs associated with construction.

Response: The cost and schedule risks associated with building a nuclear power plant are considered in FSEIS 1.2 and 2.7. These risks are considered in the cost and schedule estimates. TVA's experience with completing Watts Bar Unit 1, refurbishing and restarting Browns Ferry Unit 1, and the current efforts to complete Watts Bar Unit 2 provide confidence in the processes and practices TVA has established to complete a nuclear unit at BLN within cost and schedule estimates. For the B&W design, similar to the process at Watts Bar Unit 2, construction will not begin until engineering is substantially complete. This practice provides assurance that the full scope of activities required to support construction is clearly defined.

For the AP1000, the Part 52 'one step' licensing process is designed to minimize licensing schedule risks, and the standardized design is intended to provide a high degree of confidence in construction schedules and costs, especially for the units that follow the reference plant construction.

14. The Southeast U.S. could generate more than 15 percent of forecasted electricity demand by 2015 with renewable energy resources such as wind, solar, and biomass resources. The DEIS fails to consider biomass resources altogether in spite of clear potential within the TVA service territory.

Response: In FSEIS 2.4 TVA addresses the potential for wind, solar, biomass, and hydroelectric generation in the TVA region either alone or in combination with energy storage technologies. The results have been compared to those presented in the 2009 Southern Alliance for Clean Energy's (SACE) "Yes We Can: Southern Solutions for a national Renewable Energy Standard."

Wind: The SACE report did not provide its underlying technical assumptions for determining potential wind energy capacity, which is higher than that calculated by TVA. In Tennessee, for example, the SACE report concludes that 2,089 MW of potential wind energy capacity exists. However, using the DOE Wind Powering America basis of 163.3 km^2 (40,352 acres) of available windy land area and a reasonable assumption of 1 MW of capacity per 60 acres of land, TVA calculates that the potential wind energy capacity is 672.5 MW. The SACE report estimates 1416.5 MW more wind capacity in Tennessee alone.

Solar: The SACE report extrapolates available capacity within each state in the Southeast from a calculation for the state of Florida for ground-mounted photovoltaic solar energy – the only technically feasible solar energy technology on a large scale in the TVA region. This results in capacity factors between 20 percent and 25 percent depending on the state, which is higher than the 17 percent calculated by TVA using the average direct solar radiation in the region. The result is a more optimistic calculation of the solar energy potential than what TVA believes is reasonable for the TVA power service area.

Biomass: The SACE report provides an estimate of potential power capacity to be generated from biomass fuels which is higher than that of the analysis conducted by TVA. The report appears to have either over-estimated the heat content of biomass fuels or assumed efficiencies for each conversion technology that are uncharacteristically high.

Hydro: The basis for the methodology used in the SACE report is similar to that used by TVA. Thus, the conclusions are reasonably similar on the basis of annual average power (MWa). The SACE report, however, cites a state-wide capacity factor for each state in the region to calculate the total feasible capacity (MW). TVA prefers to measure hydroelectric resources in terms of annual average power as it is closer to a base load equivalent.

15. TVA should look seriously at recycling waste energy (including steam, furnace gases, heat, and pressure).

Response: Recycling waste energy, combined heat and power, is an important resource alternative. TVA pursues opportunities for recycling waste energy projects with our large industrial users as they arise. These are evaluated on a case by case basis as potential purchased power agreements in our planning efforts. Concerning our existing steam generation facilities, continuous efforts are made to monitor and reduce any heat losses in our systems to make them as efficient as possible. This is typically the least cost additional power available.

For and Against the Alternatives

16. This is the best way to produce the amount of energy needed by the Tennessee Valley area with less harm to the environment.

Response: Comment noted.

17. I (we) am against implementation of Alternative C.

    Response: Comment noted.

18. I (We) prefer or support the selection of Alternative A for implementation.

    Response: Comment noted.

19. I (We) prefer or support the selection of Alternative B for implementation.

    Response: Comment noted.

20. I (We) prefer or support the selection of Alternative C for implementation.

    Response: Comment noted.

21. I (We) prefer or support the selection of Alternative B or C for implementation.

    Response: Comment noted.

Air Quality

22. We need to move away from fossil fuels, and in particular, the Widows Creek steam plant should be taken out of service in order to remove the pollution that comes from it.

    Response: Comment noted. The Need for Power analysis conducted for this FSEIS includes the reduction of TVA's dependence on fossil fuel (see FSEIS 1.4.3). The base case and all alternatives for this analysis includes a reduction in fossil fuel capacity of 1,000 to 2,000 MW by 2015.

23. Carbon dioxide emission from construction and operation of the plant (total carbon cost) are unacknowledged, but considerable. The greenhouse gas emissions associated with nuclear generation (including uranium mining, milling, processing, enrichment, fuel fabrication and radioactive waste storage) come close to those of natural gas generation and are far higher than renewable energy sources.

    Response: Nuclear power plants do not emit carbon dioxide in large quantities during the normal course of operations. However, fossil fuels are often used as part of a nuclear power facility life-cycle, primarily for the manufacture of the fuel that is used in the facility. Nuclear energy life-cycle emissions include emissions associated with construction of the plant, mining and processing the fuel, routine operation of the plant, waste disposal and decommissioning. Numerous studies demonstrate that on a life-cycle based comparison, nuclear generated electricity emits about the same amount of carbon dioxide per kWh as renewable energy sources and far less than fossil fuel sources. One such study is from the University of Wisconsin, "Life-Cycle Assessment of Electricity Generation Systems and Applications for Climate Change Policy Analysis" (Meier 2002). A discussion of life-cycle carbon dioxide emissions from nuclear power plants has been added in FSEIS 3.16. 3.

24. Reducing demand for electricity with efficiency and renewables will reduce emissions from combustion of fossil fuels at utility power plants.

> *Response:* See response to Comment 22. Energy efficiency and renewable contribute to lower emissions from TVA's existing coal plants.

25. Nuclear power is not the answer to the carbon-fueled climate change crisis. We should not exchange one environmentally damaging technology for another.

> *Response:* Nuclear energy has a proven ability to safely generate large quantities of reliable, affordable base load power generation with very little greenhouse gas emissions and other environmentally damaging impacts. Because low-carbon nuclear energy (life cycle) can produce more electricity than other clean sources, it can help to reduce our dependence on fossil fuels for base load generation and lead the way for other clean energy sources. Radiation releases are governed by federal regulations that ensure the protection of public health and safety.

Aquatic Ecology

26. Methods to control aquatic plants in the Tennessee River are of concern.

> *Response:* Comment noted

27. Has the environmental and energy impact statement considered the amount of coolant water needed for nuclear cooling and its impacts on aquatic ecosystems?

> *Response:* Yes, see FSEIS 2.7.2, 3.1, 3.5 and 3.7.1. The BLN site would employ a closed-cycle cooling system. Closed-cycle systems have been demonstrated to have very low effects on aquatic biota and ecosystems in the source water body. Under Alternative B or C, plant water withdrawals are 0.2 percent or less than the annual average river flow. TVA would monitor these effects during the first NPDES permitting cycle to verify that impacts to the source waterbody (impingement/entrainment of aquatic organisms) are acceptable.

28. Many fish and mussel populations throughout the entire Tennessee River, including the Bellefonte site, are greatly reduced from their historical numbers.

> *Response:* Guntersville Reservoir was impounded in 1939. Prior to impoundment, the reach of the Tennessee River that is now inundated by Guntersville Reservoir supported a more diverse fish and mussel community. Impoundment changed this reach from a free-flowing river, characterized by a diversity of habitats (shoals, etc.), into a reservoir. Many fish and mussel species could not adapt to these changes.
>
> TVA fish data collected from 1949 until present was reviewed to assess changes in fish species composition shortly after impoundment until present. During 1949 to 1989, 70 species were collected in TVA fish surveys in Guntersville Reservoir. A total of 71 species have been collected in Guntersville Reservoir in TVA fish samples over the past 20 years. Two of the 71 species collected in recent surveys (Atlantic needlefish and inland silverside) invaded the Tennessee River system during the past 15 years; for comparison of recent data to historic data these species are excluded. Overall, there have been no major changes in fish community composition of Guntersville Reservoir from historic data (1949 to 1989,

70 species) to recent data (1990 to 2009, 69 species). A more detailed discussion of this analysis has been added to FSEIS 3.5.1.

Rare fish species in the Tennessee River system mostly occur in reservoir tributaries that are free-flowing. Inflow areas below dams of mainstem Tennessee River reservoirs are reaches that may contain some rare species occurrences, many of which are on a seasonal basis (such as use of these areas to spawn). Bellefonte Nuclear Plant is situated approximately 35 miles downstream from Nickajack Dam in a transitional area between the reservoir inflow and forebay of Guntersville Reservoir. Fish communities of transitional areas in Tennessee River reservoirs are characterized by reservoir tolerant species and operation of this plant should have no effect on rare fish species or their habitats.

In the comments on the DSEIS, nuclear power facilities were identified as a cause of decline of fish and mussel populations in the Tennessee River system. This is incorrect. TVA currently operates three nuclear power facilities which discharge a heated effluent into the Tennessee River. Thermal discharges from each of these facilities are regulated by Section 316(a) of the federal Clean Water Act. Annual fish and benthic macroinvertebrate monitoring is conducted upstream (reference site unaffected by the plant's thermal discharge) and immediately downstream of the thermal discharge to demonstrate that these facilities are not adversely affecting fish and benthic macroinvertebrate populations as a result of thermal discharges. These data are reported annually to state and federal regulators. Operation of these facilities in a manner that ensures that the maximum thermal discharge limits are not exceeded assures protection of aquatic resources from the thermal affects of the facilities' discharges. Facilities must reduce power production, if necessary, to ensure compliance with the thermal limits in the NPDES permits.

Mussels have declined significantly in the Tennessee River system and throughout North America. Impoundment of free-flowing rivers is the primary cause of this decline. Some species have been able to adapt to reservoir environments and can be locally abundant. Many species are still extant in tailwaters below dams but are present in low numbers due to a variety of factors. Cold water dam releases inhibit reproductive physiology, reproductive timing, and may eliminate specific host fish required for reproduction. Unnatural flow regimes also interrupt reproductive timing and may scour substrates necessary for juvenile development. Many of the species that are listed as threatened or endangered under the Endangered Species Act are extant as old individuals that have remained in tailwaters since the dam was constructed. In many cases, conditions are not suitable for successful reproduction and populations slowly disappear as these individuals die. Mussel surveys conducted around the BLN site yielded mostly common, reservoir tolerant species. One individual of the pink mucket, *Lampsilis abrupta*, was found in surveys conducted for this SEIS. This species is an example of a long lived mussel that is widespread in the Tennessee River system (but rare and occurs in low abundance) and that has had limited reproductive success in areas affected by impoundments. As stated above, the BLN site is situated in a mid-reservoir (transitional) area between the reservoir inflow and forebay of Guntersville Reservoir. Mussel habitats in transition zones of Tennessee River reservoirs are typically marginal and only support viable populations of species that are able to adapt to reservoir conditions.

29. Warm water that is discharged from nuclear power plants results in 'thermal plumes' that cause stress on aquatic life, lower dissolved oxygen levels, and affect the feeding and breeding patterns of various species. Dissolved oxygen levels downstream from the Sequoyah nuclear plant were even lower as it is downstream from the Watts Bar nuclear plant. What about the impacts at the Bellefonte location, which is even further down stream?

> *Response:* Hydrothermal modeling of potential heat effects under either action alternative are discussed in FSEIS 3.1.3.1. Thermal effects of plant operations on aquatic species are addressed in FSEIS 3.5.2. TVA has modeled the potential effects of cooling water blowdown discharges on fish and shellfish communities at the BLN site and does not anticipate any significant effects to important fish or shellfish communities to occur. TVA will monitor these communities when the plant is operational to confirm the conclusion of the model.
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> TVA monitors dissolved oxygen levels in Guntersville Reservoir as part of its Reservoir Vital Signs monitoring program. Monitoring results demonstrate that, due to the physical makeup of the reservoir (relatively shallow and more riverine when compared to other reservoirs), relatively short retention times, and inflows from unimpounded rivers and streams, Guntersville Reservoir does not exhibit the low dissolved oxygen conditions that occur in some deeper reservoirs with longer retention times. Therefore, effluent from the BLN site is not expected to combine with effects from upstream or downstream industries to result in extraordinarily low dissolved oxygen levels.

Climatology & Meteorology

30. As climate change worsens, water shortages and heat waves will make nuclear power less reliable due to rising river water temperatures forcing reactors to be powered down.

> *Response:* Additional analysis was performed on the possible effects of climate change, both for temperature and water resources, and this information is included in FSEIS 3.16.3.

31. The Draft EIS did not adequately address global climate change impacts.

> *Response:* TVA has performed additional analysis of possible climate change impacts on a nuclear reactor at the Bellefonte site, as well as impacts from a Bellefonte reactor on global climate change. See FSEIS 3.16.3, Global Climate Change.

Cost of New Generation

32. Nuclear energy is the cheapest, cleanest means for producing reliable electrical energy for an ever growing power need in America.

> *Response:* Cost and emissions are two important benefits for using nuclear energy for producing reliable electrical energy. FSEIS Table 1-2 shows that completion and operation of a B&W unit (Alternative B) is the least costly alternative by 2020 and overall the most cost effective alternative for providing base load energy. FSEIS Table 1-1 shows that emissions of SO_2, NO_X, and mercury are cut by over half from

2010 levels for alternatives that include a new nuclear unit. CO_2 emissions are reduced by 1.3 percent.

33. A study of the social costs of renewable energy technologies indicate that they provide a net social benefit from employment gains and resultants wage and tax benefits from the installation of wind and solar technologies.

Response: Comment noted. Renewable energy resources are addressed in FSEIS 2.4.

34. The estimated cost to construct a nuclear power plant has risen significantly in recent years; this contrasts with some renewable energy options like solar and wind, whose costs have declined.

Response: While it is true that the cost estimates for new nuclear power plants has risen and cost estimates for solar and wind options have declined in part due to increased maturity level in the technology, nuclear is still TVA's most economical option for new generation capacity. FSEIS 2.4 discusses the renewable energy alternatives considered. While economics were not addressed specifically, each of the primary renewable technologies (wind, solar, hydro, and biomass) was found to be less environmentally preferable when compared to a generating capacity equal to that of the proposed nuclear facility (See response to Comment 14). Additionally, in order to provide a generation profile similar to a nuclear facility, renewable technologies require coupling with energy storage systems or fossil-fuel powered generation, which increases the environmental impact and costs.

35. Nuclear power plants are a poor long range investment given their long and risky construction schedules. TVA's first attempt at constructing a nuclear power plant at the site was a financial disaster. This project presents a large financial risk to TVA.

Response: See FSEIS 2.2.3 and 2.2.4. As it did with WBN 2, TVA has conducted a detailed analysis of the BLN B&W units to determine constructability, costs and risks. This has substantially increased TVA's confidence that BLN 1 can be successfully completed. TVA also carefully considered similar risks for an AP1000 unit. See FSEIS 2.3.

36. Nuclear power is expensive and would not survive without federal subsidies.

Response: Nuclear, like many generation alternatives, has a high upfront capital cost which is offset by low operating cost. Nuclear is less sensitive to fuel costs than other technologies. However, all forms of electricity generation are subsidized through the various government programs and these subsidies are factored into the economic evaluation to determine the cost of energy. TVA evaluates the total cost when making decisions about the most cost effective forms of new generation. FSEIS 1.4.5 discusses the economic benefit of adding nuclear power to TVA's generation portfolio. TVA receives no direct funding or subsidies from the federal government for the operation of its power generation system.

37. Providing the lowest cost electricity as mandated by the TVA Act will not be accomplished if either Alternative B or C is selected.

> *Response:* FSEIS 1.4.4 discusses the economic benefit of adding nuclear power to TVA's generation portfolio. While both Alternatives B and C have lower annual power costs than the base case, Alternative B (B&W) increases its cost advantage over time relative to the base case because of the lower operating cost and lower capital cost of this technology.

Delivered Cost of Power

38. Selection of Alternative B or C will reduce power costs for TVA customers and mitigate price fluctuations caused by off-system power purchases and the increased use of natural gas-fired generation to meet peak demands and meet reserve capacity requirements.

> *Response:* FSEIS 1.4.4 discusses the savings provided by completing either action alternative. See response to Comment 37.

39. Because of TVA's reliance on natural gas-based generation to meet peak demands and reservation capacity requirements for most of the past decade, consumer electric bills have dramatically increased.

> *Response:* Consumer bills for electricity have increased over the past decade for a number of reasons, including fuel cost volatility, higher cost of purchased power, and lower than expected hydro generation. With a diverse generation portfolio that includes nuclear generation, TVA is better able to control energy costs and the risk to customers of increased costs of any specific generation resource is lessened.

40. Nuclear generated electricity is the least expensive generating option, or is at least cost-effective.

> *Response:* Nuclear generated electricity is one of the least expensive base load generating options to meet the growing demand for electricity in the Tennessee Valley.

41. Has an analysis been conducted comparing the cost of nuclear power compared to alternative, renewable energy sources?

> *Response:* Cost estimates for new nuclear power plants have risen and cost estimates for solar and wind options have declined due in part to increased maturity level in the technology, but nuclear is still TVA's most economical option for new generation capacity. FSEIS 1.4.4 compares the cost of various generation options, including an enhanced EEDR program and concludes that completion of the nuclear unit at Bellefonte is the most economical way to meet the projected demand.
>
> FSEIS 2.4 discusses renewable energy alternatives, while economics were not addressed specifically, each of the primary renewable technologies (wind, solar, hydro, and biomass) was found to be less environmentally preferable when compared to a generating capacity equal to that of the proposed nuclear facility. (See response to Comment 14) Additionally, in order to provide a generation profile similar to a nuclear facility, renewable technologies require coupling with energy

storage systems or fossil-fuel powered generation, which increases the environmental impact and costs.

Demand-Side Management (DSM)

42. TVA should invest money in an aggressive advertising campaign for conservation energy efficiency programs they are offering.

> *Response:* Comment noted. TVA will continue to develop cost effective EEDR programs to help meet future load growth as well as prepare for the possible placement of aging fossil generation units in long term layup. Advertising campaigns are an important consideration that is incorporated into program design.

43. TVA recognizes the benefits of a well-diversified resource mix to address uncertainties associated with any one kind of energy resource, but dismisses demand response and energy efficiency programs because TVA considers these programs will take time to implement and could have uncertain results. Building a new nuclear reactor does not diversify TVA's energy mix since the utility is already heavily reliant on nuclear power.

> *Response:* TVA recognizes that EEDR programs play an important part in meeting our energy needs. As discussed in the response to Comment 12, the demand reduction and energy savings associated with EEDR programs have been included in our updated need for power analysis in FSEIS 1.4. TVA will continue to develop cost effective EEDR programs to help meet future load growth as well as prepare for placement of aging fossil-generation units in long-term layup. Currently about one third of TVA's power mix is nuclear generation. Adding a single nuclear unit in 2019 will increase the contribution by a small amount (see FSEIS Figure 1-7).

44. TVA has not, to date, effectively addressed energy efficiency as a resource. Energy efficiency is the most cost-effective, near-term strategy to ensure future system reliability. TVA should focus on the implementation of energy efficiency programs or refute the studies that show energy efficiency to be a potentially significant resource in the TVA service territory.

> *Response:* The FSEIS has been updated to include an EEDR program that reduces required energy needs by about 5,200 GWhs in the 2018-2020 time period. FSEIS 2.4 has been revised to include a comparison of TVA's EEDR program with recent studies that describe potential energy reductions in the TVA service territory due to energy efficiency. For additional information see FSEIS 1.4, 2.4 and the response to Comment 12.

Energy Alternatives

45. Nuclear power, clean coal, U.S. produced petroleum, geothermal, wind, and natural gas are all components to energy independence and will all be needed to meet increasing energy demand.

> *Response:* TVA uses a diverse portfolio of EEDR and supply side resources to meet the electricity needs of our customers. This approach helps mitigate risks such as those associated with fuel dependence. As we develop our portfolio of base, intermediate and peaking generation resources to meet projected load requirements we consider all viable options in our planning efforts.

46. Since TVA has initiated a renewed integrated resource planning process that is not yet complete, making a final determination of the need for an additional nuclear reactor at the Bellefonte site means that up-to-date analysis of various alternatives will not be factored into the decision-making process, which does not live up to the purpose of NEPA to require a full and fair consideration of all reasonable options. TVA must delay deciding on whether to build the proposed nuclear reactor at the Bellefonte site until this resource planning process has resulted in a comprehensive plan that fairly considers all viable resource options.

> *Response:* One of TVA's most important responsibilities is ensuring that it is able to meet the demand for electricity placed on its power system. Thousands of businesses, industries and public facilities, and millions of people depend on TVA each day to reliably supply their power needs. To meet this responsibility TVA forecasts the future demand and the need for additional generating resources in the region it serves. Because planning, permitting, and construction of new generating capacity and transmission requires a long lead time, TVA must make decisions to build new generating capacity well in advance of the actual need. Waiting until the Integrated Resource planning process is complete in 2011 would put TVA at risk of not being able to meet the capacity needs in the 2018-2020 time frame and could remove completion of one of the BLN units as a viable resource option for meeting this identified need. Similarly, TVA has proceeded to acquire additional wind resources while the integrated resource planning process is underway to make sure it secured these resources at an optimal time.
>
> Commenters identified renewable energy resources and EEDR resources, specifically, as the resources that needed more consideration in the context of the proposed construction of a nuclear unit at the BLN site. In response, TVA has expanded the discussion of these resources in the FSEIS and comment responses, including analyzing an enhanced, more aggressive EE program. Based on this analysis, TVA has determined that one nuclear unit still was the low-cost option for meeting TVA's purpose and need. See FSEIS 2.4 for a discussion of alternative energy resources.

47. The FSEIS should discuss the contribution of energy efficiency/conservation programs and the generation of electricity from renewable resources in terms of the purpose and need of the proposed BLN unit. TVA should focus on an energy policy that invests in clean, renewable energy sources such as wind and solar, and that includes a comprehensive energy conservation and efficiency program. TVA should offer incentives to residential and commercial entities to offset the cost of installing renewable energy technologies.

> *Response:* The contribution of EEDR programs and the generation of electricity from renewable resources are more fully addressed in FSEIS 1.4 and 2.4. Currently TVA is actively pursuing renewable generation capacity through our Green Power Switch and Generation Partners programs and has recently added 1,300 MWs of wind resources to its energy portfolio through several power purchase agreements. TVA currently provides incentives to customers through the Energy Right and Generation Partners programs.
>
> TVA anticipates using a mix of resources, including EEDR programs, renewable resources, natural gas-fired generation, and nuclear generation to provide the additional future needs. Given the magnitude of the capacity and energy need, and

to avoid the risk of relying on only one fuel or technology, no single resource should be used to meet all of the future energy and capacity requirements. TVA has determined that adding a nuclear unit at the BLN site is the most cost effective alternative to meet a portion of these future needs.

48. TVA's current portfolio of nuclear and fossil fuel-fired electricity generation facilities presents real economic impacts in terms of public health in the region, particularly medical care costs and early death. TVA should adopt a carbon negative energy policy that invests in clean, renewable energy sources such as wind and solar, and that includes a comprehensive energy conservation and efficiency program. Such an energy policy will generate benefits to public health and the economy.

Response: TVA's current energy policy includes energy conservation and efficiency programs. Nuclear energy has a proven ability to safely generate large quantities of reliable, affordable base load power generation without greenhouse gas and other emissions. NRC regulations ensure that public health and safety are adequately protected from radiation exposure. Because low-carbon nuclear energy (life cycle) can produce more electricity than other clean sources, it can help to reduce our dependence on fossil fuels for base load generation and lead the way for other clean energy sources. FSEIS 1.4 shows that the base case and all alternatives reduce carbon emissions from present levels.

49. Energy storage technologies are becoming economically and practically viable as evidenced by information available from the US Department of Energy.

Response: Comment noted. TVA continues to evaluate energy storage technologies and how they can fit into its portfolio. Energy storage is primarily used to help manage peak demands by storing power generated off peak for use during times of peak demand or to mitigate the variability of renewable fuel supply such as wind and solar providing a more stable energy generation profile. FSEIS 2.4.2 discusses various energy storage alternatives.

50. TVA should make public any and all analysis that indicate the environmental impacts of solar and wind energy 'are equal to or greater than those of a nuclear plant.'

Response: FSEIS 2.4 has been revised to include a more robust discussion of the potential for renewable resources. Renewable energy sources such as wind and solar have significant land requirements to generate electricity comparable to that of a nuclear facility. Additionally, to provide generation profiles similar to a nuclear unit, they must be coupled with energy storage capacity which increases the land requirement to compensate for additional efficiency losses or with fossil-fueled generation which increases the impact on air quality. Biomass as a renewable fuel can be used to provide high capacity factor power provided adequate fuel supply exists; however, the air quality impacts are higher than a nuclear unit. Hydroelectric power has been concluded to be less environmentally preferable given its low capacity factors, environmental impacts, and the limited availability of feasible new sites in the TVA territory.

51. While the US might not need to build any coal or nuclear plants to meet the base load, as generation units age, the challenge will be to replace their capacity with the most forgiving electricity sources, which will be renewable energy sources.

Response: Renewable energy sources are one supply side option to meet TVA's energy needs. The need for power analysis in FSEIS 1.4 has been updated to include renewable resources and discusses their appropriate utilization for meeting power needs. Likewise, a discussion of renewable resources considered as an alternative to the nuclear plant is also included in FSEIS 2.4.

52. The region needs to move away from coal and adopt nuclear and non-polluting renewable resources. The region has too many coal burning units, which pose hazards. How many millions of tons of coal ash does TVA own?

Response: TVA continues to develop cost effective EEDR and renewable energy programs to help meet future load growth and provide the flexibility to retire older fossil generation. Nuclear energy has a proven ability to safely generate large quantities of reliable, affordable base load power generation without greenhouse or other gas emissions. TVA currently has 217 million tons of coal combustion products (CCP), including fly ash, bottom ash, slag, gypsum, char, and spent bed which is stored in ponds and landfills. TVA beneficially reuses 38 percent of its CCP.

53. The high temperatures used in incineration and gasification waste biomass, as well as the cooling process following burning, can produce toxic and acidic gases, metals, dioxins, and furans that are dangerous at extremely low levels. Some are persistent and bioaccumulative.

Response: Comment noted. Any fuel that TVA considers for combustion is thoroughly evaluated for environmental impacts including emissions. Any waste sources that are high in heavy metals, toxins, etc. are not accepted as fuel sources.

54. Biomass should not be considered a renewable energy, as waste is not a renewable resource.

Response: Comment noted. Broadly speaking there are two biomass energy feed stocks—biomass waste and biomass crops. The latter clearly is renewable because crops, such as switch grass, can be repeatedly grown and harvested to feed a biomass combustor. Biomass waste—such as wood wastes from industries using forest products—also is considered renewable because it is derived from a renewable resource initially. The sustainable availability of biomass waste is a factor that must be carefully considered when deciding to rely on biomass waste as an energy resource.

55. If increased generating capacity is necessary, TVA should build a natural gas generation plant at the site. Such a plant could be built more quickly with a lower installed cost and less technological risk, and would eliminate some of the waste generation and public and environmental health concerns of a nuclear generating facility.

Response: Natural gas generation was considered as an option to meet the purpose and need of TVA's current proposal in the FSEIS 2.4.2. Our need for power analysis predicts a need for 7500 MW additional generation capacity from 2010 to 2019 (medium-load forecast). Due to the relatively high cost of natural gas as a fuel, natural gas plants were found to be most suitable for meeting intermediate and peaking needs. Additionally, the negative impact to air quality from gas-fired generation exceeds that of nuclear power. Nuclear energy has a proven ability to safely generate large quantities of reliable, affordable base load power generation. Nuclear waste is discussed in FSEIS 3.18. Constructing and operating natural gas generation at the BLN site was evaluated in detail in TVA's Final Environmental Statement, "Bellefonte Conversion Project" (TVA 1997).

56. A 800mgw natural gas combined cycle plant is a solution along with energy efficiency measures and updating hydroelectric generation and power distribution systems.

Response: FSEIS 2.4 discusses alternatives that do not require new generation, such as energy efficiency, and those that do, such as natural gas-fired technology and hydro power, as well as combinations. The discussion concludes these alternatives are less environmentally preferable to the nuclear facility.

57. It is unreasonable to expect all renewable technologies to produce full base load capacity. Solar peaking units should also be seriously considered.

Response: The load shape of our energy requirements dictates the type of resources that are considered as alternatives in the FSEIS, as well as how they are utilized to meet customer demand. Here the need is for base load generation, not peaking generation. Matching resources to the hourly demands requires a diverse portfolio of resource options.

FSEIS 2.4 shows that renewable energy sources such as wind and solar have significant land requirements to generate electricity comparable to that of a nuclear facility. Additionally, to provide generation profiles similar to a nuclear unit, they can be coupled with energy storage capacity which increases the land requirement to compensate for additional efficiency losses or with fossil-fueled generation which increases the impact on air quality.

58. The FSEIS should include an analysis of the significant direct solar conversion capability in the vicinity of the Bellefonte site.

Response: FSEIS 2.4.2 has been updated to further explain the feasibility of solar-powered generation in the TVA service area using direct normal insolation and diffuse horizontal radiation data provided by the National Renewable Energy Laboratory. Solar plants have significant land requirements to generate electricity comparable to that of a nuclear facility. Additionally, to provide generation profiles similar to a nuclear unit, they must be coupled with energy storage capacity which increases the land requirement to compensate for additional efficiency losses or with fossil-fueled generation which increases the impact on air quality.

59. New solar capacity can be closely tailored to rising demand due to short construction times.

Response: See the response to Comments 57 and 58. Despite shorter construction times, solar generation is not considered a suitable option for the base load need identified in this FSEIS. FSEIS 2.4.2 has been updated to further explain the potential of renewable resources, including solar, in the TVA service area.

60. The Department of Energy projects that if solar energy capacity increase goals are achieved, it would put the U.S. industry on track to reduce the cost of electricity produced by PV from current levels to a price that is competitive in nationwide markets.

Response: TVA monitors the progress made in the development of various demand and supply side options to meet our future energy needs. As developmental goals are realized the new characteristics of the options are entered into our planning models for future decisions.

FSEIS 2.4.2 has been updated to further explain the feasibility of solar-powered generation in the TVA service area using direct normal insolation and diffuse horizontal radiation data provided by the National Renewable Energy Laboratory. PV solar generation is not considered a suitable option for the need identified in this FSEIS. In addition, as this comment suggests, solar energy currently is substantially more costly than other energy resource options

61. Wind energy produces three times the total U.S. electric power need annually. Wind power is becoming one of the lowest cost energy technologies with zero waste and should be among TVA's highest priorities.

Response: TVA is actively pursuing renewable generation capacity through our Green Power Switch and Generation Partners programs. In addition, TVA has recently acquired 1,300 MWs of wind energy through several power purchase agreements.

While an important part of our clean energy portfolio, the use of wind power to provide base load generation requires coupling with either fossil-fueled generation or energy storage. FSEIS 2.4.2 discusses this potential for wind power in the TVA region and concludes that it is less environmentally preferable to the proposed nuclear option, primarily due to the large land area requirement to provide a comparable source of base load generation.

62. Most thermoelectric power plants have an efficiency factor of about 33 percent (two thirds of the power released by the heat source is wasted and is released to the environment as hot water). To meet base load demand, thermoelectric plants build thermal capacity three times the desired electric power need. Similarly, base load power from wind turbines requires the construction of about three times to needed electric capacity to deliver reliable base load power.

Response: Some inefficiency is inherent in the process of thermoelectric generation. However, these thermoelectric plants provide electricity in a reliable manner.

Floodplain and Flood Risk

63. Of concern in terms of the site and the proposed facility is the possibility of flooding in the Guntersville Watershed.

> *Response:* Completion or construction and operation of a nuclear plant at this location would not increase the flood risk in the Guntersville Reservoir watershed because the plant would not impact upstream flood elevations. Nor would there be unacceptable flooding risks at the site itself. See FESIS 3.3.

64. The DSEIS indicates that all safety related structures are located above the PMF levels or have been flood-proofed. When additional site hydrological studies completed, analysis could result in a PMF higher than assumed in the design, which could require additional construction not already assumed in the DSEIS. Without a completed hydrology analysis, the Draft SEIS cannot address the potential impact of any additional construction.

> *Response:* FSEIS 3.3.1 has been updated based on the 2009 re-verification of the Probable Maximum Flood (PMF), the controlling PMF elevation at the BLN site. The PMF would be 625.7 feet msl with dam safety modifications that were made to Watts Bar and Nickajack dams. The maximum wind wave activity is estimated to be 1.3 feet high. Therefore, the PMF and coincident wind wave activity results in a flood elevation of 627.0 feet msl which is below the B&W plant flood design grade elevation of 629.1 and the AP1000 plant grade elevation of 628.6.

65. Possible issues with the location of safety systems in terms of the Probable Maximum Flood levels were not adequately addressed in the NEPA analysis.

> *Response:* FSEIS 3.3.2 has been updated to clarify that, under both Alternatives B and C all safety-related structures are either located above or flood-proofed to the Tennessee River PMF and coincident wind wave elevation of 627.0 feet msl, and above the probable maximum precipitation (PMP) site drainage elevation of 627.53 feet msl.

Need for Power

66. TVA has not demonstrated realistic future projections of electrical needs nor financial reductions of debt.

> *Response:* FSEIS 1.4 describes the methodology used to estimate our future energy needs. The methodology is comparable to that used by other large utilities. TVA's 2007 Strategic Plan calls for TVA to pay its financing obligations before the power generating assets supporting those obligations are fully depreciated. Also, any new debt will be supported by new assets. In following these principles, TVA ensures that it maintains a debt level that is supportable based on the size and scope of operations.

67. With the growth in the Tennessee Valley region and with electric vehicles on the horizon, TVA must invest in new base load supply. Otherwise, its base load fleet would be further strained and its peaking fleet would be operated more often, effectively increasing the cost of TVA power.

Response: Comment noted. If widespread use of electric vehicles becomes a reality, we anticipate that TVA's load shape will flatten somewhat, lessening the need for peaking resources and increasing the need for more base load resources.

68. The recession has reduced the consumption of electricity and many utility executives believe that this recession's recovery will not follow traditional patterns due to advances in energy efficiency.

Response: As stated in FSEIS 1.4.1, future growth is expected to be lower than historical averages, including the impact of the 2008-2009 recession.

69. TVA's projections for 2030 system energy and summer peak are inaccurate and cannot be used to determine the need for more generating capacity since they do not include the 1200MW peak reduction that TVA plans to deliver in 2012, the effects of the Time of Use pricing rate structure anticipated to occur in 2012, or the anticipated legislation that will put a price on carbon.

Response: The need for power analysis for Bellefonte is not based on 2030 projections for system energy and summer peak loads. FSEIS 1.4 discusses the methodology used to determine the need for power, which includes the load forecast, current system resources, and forecasted additions for all years of the forecast. FSEIS 1.4 has been updated to include a number of changes in planning assumptions that have been made as part of the normal business planning cycle, including adjustments to reserve requirements, forecasted hydro production, fuel and emissions allowance prices, an updated load forecast, power purchase agreements for wind energy, increased emissions control from coal plants, long term layups of coal capacity, and the addition of an EEDR program. The potential impacts of carbon legislation are included in the production cost model.

70. TVA needs to revise downward its projected need for additional capacity based on the EIA's updated projection (December 2009) of the growth in electricity.

Response: The need for power projection in the DSEIS matches that of the EIA'S updated projections of growth in electricity. In order to address the uncertainty of economic growth, TVA's forecast includes analysis of both higher and lower than expected economic growth. As stated in FSEIS 1.4.1, future growth is expected to be lower than historical averages including the impact of the 2008-2009 recession. An updated analysis of the need for power is provided in FSEIS 1.4.

Even though historically, net system requirements (NSR) grew at an average rate of 2.3 percent (1990-2008), in TVA's current forecast, NSR shows a reduction in demand through 2010, reflecting the weak economic conditions compounding over the last year. In TVA's forecast, the average annual growth rate recovers to 1.3 percent, which is higher than EIA's longer term projection (2012-2028) in the December 2009 forecast, but remains lower than the growth rate over the 18-year historical period. For comparison, the long-term net system requirements in the low economic conditions case grow at an average annual rate of 0.3 percent (much lower than the 1.0 percent in EIA update); whereas, in the high economic conditions case, NSR forecast shows average annual growth of 2.0 percent, double that of the EIA update, but still lower than the 18-year historical period of the Tennessee Valley.

71. The hydro and steam plants are experiencing a lot of stress and it's straining the systems.

Response: TVA maintains and operates its coal fleet and hydro plant in a manner that optimizes generation. The success of meeting the January 2010 cold spell, which was a new peak for TVA, suggests the strengths of the TVA system. However, TVA is paying more attention to maintenance activities. The additional base load generation that a nuclear unit provides will ensure that TVA will be able to meet the increasing base load demand while maintaining system reliability.

72. It makes sense to use a site that has already experienced a great deal of development as a nuclear power plant, like Bellefonte, instead of developing another site to increase the electrical base load.

Response: Making use of the infrastructure at the Bellefonte site maximizes the use of existing assets, avoids larger capital outlays, and avoids the environmental impacts and extended project schedule of siting new power generating facilities elsewhere.

Nuclear Plant Safety and Security

73. There is no such thing as accident-free nuclear power; all reactors are susceptible to operator error or programming errors.

Response: Nuclear plant accidents are discussed in detail in FSEIS Section 3.19. Additionally, information pertaining to nuclear plant safety can be found at the following links:

<http://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0164/r4/>

<http://www.nei.org/keyissues/safetyandsecurity/operationalsafety/>

<http://www.world-nuclear.org/info/inf06.html>

74. Nuclear power reactors release radioactive gases and liquids into the environment as a result of accidents, as well as normal operations.

Response: The FSEIS addresses both normal operations and accidents. See Sections 3.17, 3.19.1, and 3.19.2 regarding the radiological effects of normal operation, design-basis accidents, and severe accidents, respectively. All calculated doses are within the applicable NRC limits.

75. The incident at Browns Ferry nearly resulted in the loss of everything by everyone living downwind of the site.

> *Response:* Safe operation of our nuclear plants is of utmost importance. The safety of nuclear plants is highly regulated by the NRC and TVA continues to comply with all applicable safety standards. Worker training and compliance with written procedures are used to prevent incidents such as the Browns Ferry event which happened in 1975, 35 years ago. See FSEIS 3.19 for analysis and further discussion of plant safety and security.

76. The uncertainties associated with new nuclear reactors continue to escalate, putting people and the environment at increasing risk.

> *Response:* The new reactor licensing process is designed to reduce risk and uncertainty. The NRC safety and environmental reviews are extremely thorough and complete. The process ensures that the designs are substantially complete before the Design Certification and Combined Operating Licenses are issued, further reducing risk and uncertainty. The technology, design methods and analyses used in new reactor designs have reduced the uncertainty to levels that meet or exceed the published NRC safety goals.
>
> A probabilistic risk assessment (PRA) has been submitted as a part of the AP1000 design certification application in accordance with 10 CFR Part 52. The PRA evaluation, provided in Chapter 19 of the AP1000 DCD, evaluates the AP1000 design, including plant, containment, and typical site analysis that consider both internal and external events. The AP1000 design process included a risk assessment of the design prior to being finalized to optimize the plant with respect to safety. The risk informed design process resulted in the selection of design alternatives which increased the overall level of safety and verified that the US NRC PRA safety goals have been satisfied.
>
> The risks associated with operation of a new AP1000 plant at the Bellefonte site are addressed in Section 7.2 of the COLA ER (TVA 2008a). The reported early fatality risk resulting from a severe accident is zero and the latent (cancer) fatality risk is 1.83E-05 per reactor year. As discussed in Section 7.2, these risks meet the nuclear regulatory commission's safety goal policy statement. Therefore, the early and latent fatality risks from a severe accident at the BLN site are considered acceptable. The risks associated with operation of B&W and AP1000 reactors are addressed in FSEIS 3.19.

77. No fire-endurance tests have been conducted to qualify Hemyc as an NRC-approved one-hour or three-hour fire barrier for installation at nuclear power plants.

> *Response:* TVA is aware of the issues with Hemyc. TVA construction will utilize an approved and qualified fire barrier design.

78. What will the impact be, if any, on the general aviation airport in Scottsboro given the proximity of the Bellefonte plant and towers to the approach and glide pattern?

Response: The Bellefonte Nuclear Plant should have no impact on the general aviation airport in Scottsboro. See response to Comment 79. In addition, the BLN Units 3 and 4 COLA, Section 3.5.1.6, analyzed the probability of an aircraft crash from the Scottsboro airport, including projected growth through 2060, and found "the aircraft hazards pose no undue risk to the health and safety of the public." Similarly, the BLN Units 1 and 2 FSAR evaluated the potential aircraft crash from the Scottsboro airport and found the results acceptable.

79. Will there be any security areas, off-limits areas, or any other restrictions that may impact local aviation?

Response: There will be no restrictions that would affect local aviation.

80. The nuclear option makes us more susceptible to danger from a variety of sources, including hazardous wastes and terrorism. Terrorism targeting the nuclear plant presents serious risks to our safety.

Response: TVA believes that the possibility of a terrorist attack affecting operation of one or more units at the BLN site is very remote and that postulating potential health and environmental impacts from a terrorist attack involves substantial speculation. Notwithstanding the very remote risk of a terrorist attack affecting operations, TVA increased the level of security readiness, improved physical security measures, and increased its security arrangements with local and federal law enforcement agencies at all of its nuclear generating facilities after the events of September 11, 2001. These additional security measures were taken in response to advisories issued by NRC.

Nuclear Reactor Design

81. Both of the proposed nuclear plant designs are problematic, untested in the U.S., and potentially costly and unsafe. An AP1000 reactor has never been constructed. In addition, the design of the AP1000 reactor is problematic and presents a financial (and potentially a safety) risk.

Response: The B&W design at Bellefonte is an enhancement of proven B&W plants that are successfully operating in this country. The B&W 205 reactor has improved operating margins and the Bellefonte plant design has incorporated many other safety and operational improvements. This design was built and operated well in Germany (the Muelheim-Kaerlich reactor) before it was shut down for reasons unrelated to its performance.

AP1000 units are currently under construction in China and are scheduled to be operational several years before any planned need at Bellefonte. Additionally, three US utilities are planning to begin construction on AP1000 units before TVA. These efforts will serve to confirm construction techniques and schedules, reduce cost and schedule risks, and provide valuable lessons learned before construction would begin at Bellefonte. The design of third (or later) generation reactors is specifically intended to provide safety enhancements and improved operability over the existing nuclear fleet which have demonstrated an impressive reliability and safety record.

Westinghouse, along with the AP1000 owners group, is working diligently to resolve the remaining NRC licensing issues and has proposed design changes to respond to the cited NRC concern. Recertification of the design is anticipated in 2011.

82. The Draft SEIS states that in 1988 when TVA abandoned plans to complete the reactors, Unit 1 was 90 percent complete and Unit 2 was 58 percent complete. However, due to new construction standards and other upgrades, the completion levels may translate into only 55 percent and 35 percent complete. This should be addressed in the FSEIS.

Response: FSEIS 2.2.2 and 2.2.3 have been revised to address the completion status of Unit 1 and Unit 2 and the activities required to complete a unit.

83. Existing assets should be utilized to maximize the use of existing disturbed lands and minimize new land disturbances.

Response: Use of existing assets to obtain new generation sources makes good business and environmental sense. As discussed in FSEIS 2.2 and 2.3, for either alternative TVA would utilize existing assets to maximize the use of existing disturbed lands and facilities, and to minimize new land disturbances.

84. So-called 'cookie cutter' reactors are not standard and require substantial site-specific design changes, adding to uncertainties about performance and reliability. Substantial site-specific design changes necessary during the construction of previous nuclear power plants have delayed construction and created uncertainty regarding performance and reliability.

Response: Substantial site-specific design changes have not been necessary for the AP1000 units. The AP1000 utilities and Westinghouse have worked closely together to achieve an extremely high degree of standardization in both plant design and operational programs. Further, design and engineering work will be substantially complete prior to construction minimizing the potential for design changes and schedule delays. This commitment to standardization will ensure that construction schedules and reliable performance have a high degree of certainty.

85. The building of new-design AP1000 reactors should not even be considered until the design problems, critiqued by the Nuclear Regulatory Commission, have been fully resolved.

Response: An AP1000 reactor can only be constructed after Westinghouse has received the approved design certification from the NRC.

Radiological Effects

86. Independent studies have shown increases in childhood leukemia near nuclear facilities in La Hague, France. TVA should study these findings.

Response: The Compagnie Générale des Matières Nucléaires (COGEMA) La Hague spent fuel reprocessing facility near Cherbourg, France is unlike any domestic nuclear facility because spent fuel is not currently reprocessed in the United States. The proposed BLN commercial nuclear power plant will not reprocess nuclear fuel, and there would not necessarily be any correlation between the anticipated radiological impacts associated with the operation of the COGEMA facility and operation of an AP1000 or B&W reactor at BLN.

The NRC periodically investigates the cancer risks for populations that live near nuclear power facilities as part of its mission to protect the health and safety of the public. The NRC uses the results of these studies to provide assurance that current regulations provide adequate protection for the health and safety of the public. In fact, the NRC has recently asked the National Academy of Sciences to perform an updated study regarding these risks. If the NRC were to find that current regulations do not adequately protect the public, the regulations would be modified so as to do so. TVA is obligated to comply with all regulations applicable to each of its nuclear facilities. In addition to complying with applicable regulations, TVA keeps abreast of studies performed regarding the potential effects of nuclear facilities on the health and safety of the public through the Nuclear Energy Institute. There have been numerous studies performed in the United States, Canada, and Great Britain that found no correlation between nuclear power plants and cancers (see <http://www.nei.org/keyissues/safetyandsecurity/factsheets/safetystudiespublicworkerspage2/>).

87. Can TVA ensure that nuclear power is safe given the potential effects on the environment and the quality of life of current and future generations of residents as a result of the generation of waste products?

Response: The handling, transportation and storage of spent fuel and irradiated waste are highly regulated and are safely managed. The NRC has independently determined that these waste forms can be safely stored until they are eventually disposed of permanently. TVA's plans for storing spent fuel and radwaste that would be generated during the operation of the B&W and AP1000 reactor units are described in FSEIS 3.18.2.

88. Radioactive pollution from nuclear power plants is invisible and a threat to public health.

Response: The FSEIS addresses the radiological effects of normal operation, design-basis accidents, and severe accidents in FSEIS 3.17, 3.19.1, and 3.19.2 respectively. All calculated doses are within the applicable NRC limits. The average annual dose within 50 miles of a nuclear power plant due to normal radioactive effluents is much less than the average annual background radiation dose.

Radiological Waste (RadWaste)

89. Groundwater and surface waters in France are reported to have been impacted by leaks from on- and off-site storage facilities. These events should be studied by TVA.

Response: The radioactive waste leaks from French nuclear facilities came from waste processing plants and not from power plants. As indicated in FSEIS 3.2.1, groundwater quality at BLN has been monitored over the years to obtain background concentration data. During operation, TVA will continue to monitor groundwater and surface waters to ensure that water quality standards are maintained. The radiological environmental monitoring program (REMP) conducted for the BLN site will be designed based on the regulatory guidance from NRC Regulatory Guide 4.1 and NUREG 1301/1302.

90. TVA nuclear power plants do not have a facility licensed to accept Class B, C, or greater-than-C radioactive waste.

> *Response:* Congress enacted the Low-Level Radioactive Waste Policy Amendments Act (LLRWPAA) of 1985 to ensure that disposal capacity would be available for all types of LLRW generated by Atomic Energy Act (AEA) licensees. Although no facility licensed for the off-site disposal of all classes of LLRW is currently available to TVA, off-site long term storage options are in the process of being developed.
>
> A Bellefonte unit is not scheduled to load fuel and begin operation for several years and will not be generating Class B and C waste until after initial operation. By that time, it is expected that a Class B and C disposal facility or a means of processing such waste in a manner that allows disposal in an existing facility will be available. Shipping waste at the earliest practicable time minimizes the need for waste reprocessing caused by potential changes in a disposal facility's requirements, reduces occupational and nonoccupational exposures from handling and maximizes the amount of onsite storage space available for use.

Seismology

91. The Bellefonte site is located about one mile from the Sequatchie Fault Line, implying an increased probability that it may experience earth tremors or possibly earthquakes. The site is also over Karst terrain which is a geological term for unstable Limestone formations characterized by fractured and shifting rock, sink-holes, ravines, and underground streams. Putting a nuclear reactor at such an unstable site might ultimately result in core meltdown.

> *Response:* FSEIS 3.15 addresses Seismology. In additon, geology, seismology, and geotechnical information is provided in the COLA FSAR Section 2.5.
>
> There is no new information to suggest that the thrust faults (including the Sequatchie Valley Fault) within the Appalachian foreland thrust belt are capable tectonic structures as defined by NRC Regulatory Guide 1.208 (Appendix A). Seismicity in the region occurs primarily within basement rocks below the regional detachment and first motion analyses indicate predominantly strike-slip focal mechanisms (see discussion in Subsection 2.5.1.1.4.2.4 of the NRC regulatory guide). Evidence for post-Cenozoic faulting or geomorphic evidence for Quaternary deformation in the region is not reported in the published literature.
>
> Investigations at the BLN site by TVA have not identified large-scale karst features (Reference 201). No natural sinkholes have been identified and no enterable caves have been located. Thick, pure limestones like the Tuscumbia, Monteagle, and Bangor Limestones that host large caverns elsewhere in Jackson County, do not occur at the site. Nevertheless, the underlying impure limestones of the Stones River Group are found to weather primarily by dissolution, and small-scale karst features are present. Karst features at the BLN site are of a somewhat different character and smaller scale than highly karstified areas of northern Alabama. Factors such as relief, hydraulic gradient, and purity of the limestone beds have combined to produce a more subtle karst terrain.
>
> The relief and hydraulic gradient at the BLN site are not favorable for the development of large cavern systems. In lowland areas like the BLN site, where

limestone units have little relief, are relatively close to groundwater levels, and groundwater has relatively low hydraulic gradients, cave systems that can be entered and explored are not known. A map of the distribution of caves in Jackson County shows hundreds of caves in the adjacent highlands, but none within the Sequatchie Valley (Figure 2.5-303; Reference 413). Cave locations shown immediately east of the site are associated with the northeast-trending escarpment of Sand Mountain, approximately 1.5 miles east of the BLN site where the Mississippian Bangor and Monteagle Limestones crop out beneath the Permian sandstone cap. Thick beds of pure limestones are not present at the BLN site. The limestone underlying the Units 3 and 4 power block construction zone belongs to the Ordovician Stones River Group and consists of beds of relatively pure limestone 80 to 100 percent carbonate) alternating with beds of argillaceous and silty limestones (30 to 80 percent carbonate). See Subsection 2.5.4.1.2 for detailed lithology and mineralogy. The presence of the impure limestone beds may inhibit development of larger conduits and favor smaller ones

Most of the cavities encountered are small, 0.1 to 0.5 ft. in height, and clustered near the top-of-rock, 62 percent within 10 ft. and 84 percent within 20 ft. of top-of-rock. At the Units 1 and 2 power block location, explored in the 1970s, 32 percent of borings encountered cavities (Table 2.5-225). Most cavities occurred in the upper ten feet of rock, and were removed during excavation. Photographs of the excavation (Figures 2.5-307 and 2.5-308) show competent rock without significant cavities at excavation grade.

Socioeconomics

92. Alternatives B or C would generate positive direct, indirect, and induced economic impacts in the immediate area and in other states in which products or services are procured.

Response: Comment noted. FSEIS 3.13.2.2 includes discussion of the beneficial effects of the construction and operation workforce for both action alternatives.

93. The current energy policy in the Tennessee Valley--in particular a lack of focus on renewable energy generation and energy efficiency programs, and the resultant waste of energy--places the region at a disadvantage in the global competition for economic development.

Response: Comment noted. TVA is committed to increasing its renewable energy and energy efficiency programs.

94. Jackson County is in need of the jobs that would be created by completion or construction and operation of a single nuclear unit at the BLN site. Training programs are being planned to help supply a qualified workforce.

Response: In addition to direct employment at the site, there would be some positive secondary impact on employment due to increased demand for goods and services by workers and their families.

95. TVA could generate a greater number of jobs in the service area by instituting aggressive energy efficiency and renewable energy programs. These labor-intensive programs could result in the creation of a greater number of jobs than would be created by pursuing the development of capital-intensive nuclear power plants.

> *Response:* To meet future power needs, TVA will need a diverse power mix. TVA is committed to decreasing dependence on high carbon-emitting fossil fuel plants by increasing generation from renewable energy sources as well as focusing on energy efficiency and demand response. TVA welcomes the opportunity to help create "green jobs" by encouraging growth of these industries in the Valley. However, the need currently being addressed is for base load power, which is best met by generators which have relatively low operating costs and which are expected to be available and able to operate continuously throughout the day.

96. An analysis should be conducted to identify the potential positive and negative impacts on the city of Hollywood of each of the three Alternatives. The analysis should identify and evaluate the possible domestic and social impacts (including effects on economics and traffic) resulting from plant construction and operation. Such impacts may include economics, traffic, strains on the police and fire departments, and impacts to City infrastructure and its maintenance.

> *Response:* FSEIS 3.13 has been expanded to provide additional information about the potential for socioeconomic impacts to the surrounding community. Although no study specific to Hollywood has been conducted, TVA plans to work with the local governments and/or community representatives during the preconstruction and throughout the construction period to identify specific problems and concerns and to assist the community in alleviating problems. This could also involve identification of positive impacts.

97. The county is prepared for the influx of construction workers and has the infrastructure in place to facilitate construction activities.

> *Response:* Comment noted. As discussed elsewhere, TVA will work with the local communities to help manage issues that arise, such as traffic concerns.

Spent Fuel

98. There is no long-term storage available for the spent fuel that would be produced by the nuclear reactors. It is desirable that a high level waste repository be licensed before the need for an on-site spent fuel storage facility in 2036.

> *Response:* The U.S. Department of Energy (DOE) is responsible for the disposal of all high-level radioactive waste generated from TVA's nuclear reactors, as well as the transportation of radioactive materials to the disposal facility. TVA plans to provide dry cask storage of radioactive materials in an on-site independent spent fuel storage installation (ISFSI) at BLN, in addition to the storage capacity of the spent fuel pool for either a B&W reactor or an AP1000 reactor, until a licensed repository or interim offsite storage option becomes available (10 CFR 51.23). A discussion of spent fuel storage is contained in FSEIS 3.18.2.

Water Quality

99. There will likely be significant negative impacts to the Tennessee River basin.

Response: State and federal pollution control regulations require that all effluent discharges from the plant have an NPDES permit from the Alabama Department of Environmental Management. These permits specify effluent discharge limits and monitoring requirements to ensure the plant has no significant harm on the receiving water body. TVA will operate the plant to comply with these requirements. A modeling assessment of potential impacts to reservoir water quality indicates that the plant will have essentially no effect on overall reservoir temperatures, dissolved oxygen concentrations, or algae biomass (see FSEIS 3.1.2 and 3.1.3).

100. Nuclear power operations degrade the water bodies from which they draw enormous amounts of fresh water.

Response: The impact of nuclear power plant operation on the water body from which they draw water is regulated under the Clean Water Act, including hydrothermal, entrainment and impingement impacts. Potential water quality impacts to Guntersville Reservoir were examined using two models, one to evaluate 'near-field' impacts in the discharge mixing zone of the plant (CORMIX), and one to evaluate 'far-field' impacts throughout the entire Guntersville reservoir (CE-QUAL-W2). These evaluations are summarized in FSEIS 3.1.3. The CORMIX analyses showed that in the most extreme events, the plant will need to curtail operation to maintain the mixing zone temperature within current regulatory limits. TVA operating procedures will include a process to continuously monitor the plant discharge temperature and provide adequate notification to curtail the plant operation in such events. The CE-QUAL-W2 analyses included a two-dimensional representation of the entire Guntersville Reservoir. Two years were simulated with CE-QUAL-W2 to assess the range of potential range of reservoir-wide impacts: 1) 1999 a year representative of typical or near average (annual) river flow, and 2) 2007 the driest year in over 100 years of record in the Tennessee Valley. The results indicated only small to no changes in reservoir water quality. As to the entrainment and impingement impacts, the closed-cycle cooling system is considered the “best technology available” to minimize these adverse environmental impacts.

101. Special attention is needed to minimize the effects of higher water temperatures to the (Tennessee) river.

Response: Both Alternative B (B&W reactor) and Alternative C (AP1000 reactor) utilize a closed loop cooling system, which minimizes impacts of the plant thermal discharge on the receiving waters. TVA is required under the provisions of the Clean Water Act to ensure that the impact of the plant discharge to the Tennessee River does not exceed state standards for water temperature that are specified in the plant NPDES Permit. These standards are summarized in FSEIS 3.1.3.1. To document compliance with these standards, the plant will include real-time instrumentation to measure the temperature of the water exiting the plant into the river, and procedures to implement changes in plant operation should the water temperature begin to approach the level of the temperature standards.

102. Nuclear power plants release radioactive contaminants and hazardous chemicals into surrounding waters resources, contribute to thermal pollution, and impact aquatic life.

> *Response:* See FSEIS 3.17.3 for radiation doses due to liquid effluents including doses to aquatic plants, invertebrates, and fish. All doses are within the applicable NRC limits.
>
> See FSEIS 3.1.4 for identification and discussion of environmental effects of chemical additives required for plant operation. The BLN site NPDES permit establishes criteria to protect Guntersville reservoir water quality for its designated uses as a drinking water source, recreation, and industrial use such as cooling. For each discharge point, the NPDES permit establishes limits for the types and quantities of effluents, monitoring and reporting requirements, and required sampling locations. Therefore, the effects of chemical discharges would be minor. See FSEIS 3.1.3 for information and an analysis of the hydrothermal effects of plant operation. Construction and operation of either a B&W or AP1000 reactor unit would meet all effluent requirements.

103. Based on observations from other nuclear power plants in Tennessee and Alabama, TVA will do an outstanding job of monitoring discharge from a new power plant at the Bellefonte site.

> *Response:* State and federal pollution control regulations require that all effluent discharges from the plant have an NPDES permit. These permits will specify effluent discharge limits and monitoring requirements. TVA will operate the plant to comply with these requirements. TVA may also conduct additional monitoring to assist in regulatory compliance, environmental protection, and efficient plant operation, especially during the initial startup of the plant.

Water Supply

104. Monitoring is necessary at downstream water intakes. Monitoring stations should be established upstream of each of the downstream water intakes; stations should be established on both sides of the river. These monitoring stations should be established in addition to those generally required of a nuclear power plant.

> *Response:* Effluent limits and monitoring requirements for discharges from the plant are established by state and federal regulations. The quality of intake water that is withdrawn by water utilities is routinely monitored by the utility as a necessary step in treating the water. Should any of these monitoring activities indicate a potential water supply concern related to the operation of Bellefonte, additional targeted monitoring may be initiated to address the concern and protect the water supply.

105. Has an analysis been conducted to evaluate the feasibility and potential impacts of water withdrawals during a global warming-induced drought?

> *Response:* The expected BLN withdrawal (makeup) is 35,000 gpm and 24,000 gpm respectively, for the B&W and the AP1000 alternatives. FSEIS 2.7.2 has been revised to clarify these data including the addition of FSEIS Table 2-5, which provides a comparison of plant water use. Also, DSEIS Tables 3-3 and 3-4 have been replaced with a new FSEIS Table 3-3. These withdrawals are approximately 0.2 percent and 0.1 percent, respectively, of the average flow at the BLN site and

approximately 2.5 percent and 1.8 percent, respectively, of the minimum expected drought flow (i.e., the minimum daily average flow of 3000 cfs from Chickamauga Dam). Potential water quality impacts to Guntersville Reservoir were examined using a two-dimensional reservoir model (i.e., CE-QUAL-W2). Two years were simulated to assess the range of potential impacts: 1) 1999 a year representative of typical or near average (annual) river flow, and 2) 2007 the driest year in over 100 years of record in the Tennessee Valley. The results indicated only small to no changes in reservoir water quality. Because plant withdrawals are small relative to average and minimum river flows (and the volume of reservoir water), and because the established minimum flows and reservoir volume are expected to be maintained even during a drought more severe than 2007, results of the modeling analysis are believed to cover reasonably foreseeable drought conditions. The discussion of global warming/climate change has been expanded. See FSEIS 3.16.

106. Has an analysis been conducted to evaluate the feasibility and potential impacts of plant water usage in light of increasing population in the region and increasing residential, commercial, and industrial water consumption?

Response: Projected 2030 water use in the area is shown in FSEIS Table 3-2, including a single BLN unit. TVA examined the potential impacts of these and other projected 2030 water supply withdrawals throughout the Tennessee Valley as part of its 2004 river operations assessment (TVA 2004). The analysis indicated that projected 2030 water supply withdrawals would be protected with the possible need for short-term mitigation measures at several locations during an extreme and prolonged drought.

107. Selection of either Alternative B or C would result in a Bellefonte plant that uses more water than conventional or renewable energy sources and more than is consumed by energy efficiency measures. The plant would be the largest water consumer in the area, and would compete with other important water users in the region. Despite this, water supply issues are not considered significant in the DSEIS.

Response: Typically, nuclear generation requires more water than solar or wind generation, but less water than bio-fuels. Solar and wind generation have other economic and environmental disadvantages. FSEIS 3.1.2 addresses surface water use and trends. FESIS Table 3-2 lists all of the surface water withdrawals in the Guntersville watershed for the years 2005 and 2030. The table shows that a single nuclear reactor at Bellefonte would be the second largest water user in 2030, with the largest being TVA's Widows Creek Fossil Plant which withdraws 1,476 MGD. However, because Bellefonte water withdrawals are small relative to the average and minimum river flows (and the volume of reservoir water), and because the established minimum flows and reservoir volume are expected to be maintained even during severe drought conditions, potential adverse impacts to Guntersville Reservoir and regional water supplies are expected to be insignificant. For example, the expected BLN withdrawal is about 35,000 gpm (with 23,000 gpm being returned to the river) and 24,000 gpm (with 8,000 gpm being returned to the river), respectively, for the B&W and the AP1000 alternatives. These expected BLN withdrawals are approximately 0.2 percent and 0.1 percent, respectively, of the average flow through Guntersville Reservoir and approximately 2.5 percent and 1.8 percent, respectively, of the minimum expected drought flow (i.e., the minimum daily average flow of 3000 cfs from Chickamauga Dam). FSEIS 2.7.2 has been revised to clarify these data including the addition of Table 2-6, which provides a comparison of plant water use. Also, DSEIS Tables 3-3 and 3-4 have been replaced with a new FSEIS Table 3-3.

108. The DSEIS does not address the cumulative impacts presented by the possibility of having eight nuclear reactors operating in the Tennessee River basin along with other facilities.

Response: Currently there are six nuclear units operating in the Tennessee River Basin. Proposed additional units include one unit at Bellefonte and one additional unit at Watts Bar. Both of these units would have closed cycle cooling systems that involve small hydrothermal discharges relative to the adjacent river flow and reservoir volumes. As explained in the FSEIS 3.1.3.1, the hydrothermal analysis encompasses worst-case conditions based on potential ranges for river flow, river temperature, meteorology, and plant operations, using more than 30 years of historical data. The range of river flow was based on historical hydrology and the expected future operating policy of the TVA river system. As indicated in the FSEIS 3.1.3.2, Environmental Consequences, the CE-QUAL-W2 model assessed potential cumulative effects on Guntersville Reservoir and concluded that far-field effects would not be significant. Given these findings and with design and operation in compliance with regulatory requirements, single nuclear unit operations at Bellefonte are not expected to have adverse cumulative impacts on surface waters.

109. The FSEIS should present data on the volume of water consumed and evaporated at each of TVA's currently operating nuclear reactors and coal fired power plants.

Response: Total water withdrawal from TVA nuclear and coal-fired power plants in 2005 was approximately 15,539 MGD. Return flow totaled approximately 15,463 MGD resulting in a consumptive use of 76 MGD. In contrast, the average annual flow in the Tennessee River out of Chickamauga Dam is about 20,680 MGD. Information on individual plants in the Tennessee Valley can be found in the following FSEIS reference.

Bohac, C. E. and M.J. McCall. 2008. *Water Use in the Tennessee Valley for 2005 and Projected Use in 2030.* Retrieved from <http://www.tva.gov/river/watersupply/watersupply_report_to_2030.pdf>

Wetlands

110. TVA should avoid impacts to the wetlands located at the AP1000 site.

Response: This wetland complex would be impacted (filled) if the AP 1000 alternative is selected. FSEIS 3.4.2 documents this impact. TVA took this environmental impact into consideration in selecting the B&W reactor as its preferred alternative. Should TVA decide to build the AP1000 reactor, the loss of wetland functions would be compensated for via wetland mitigation (purchase of wetland credits from a wetland mitigation bank within the watershed).

List of Individual Commenters and Associated Comment Statement Numbers

Name Business or Organization	Associated Comment Statement Numbers
Akridge, Charles	21
Bailey, Ron	78, 79
Barczak, Sarah *Southern Alliance for Clean Energy*	12, 13, 14, 18, 28, 29, 31, 34, 43, 44, 46, 50, 63, 64, 76, 81, 82, 102, 105, 107, 108
Bradley, Heather	87
Bundy, Laura	15, 18, 36, 37, 44, 70, 98
Bynum, Faye & Wayne	21, 94
Cannon, Henry	21
Cummins, Wayne *Sand Mountain Concerned Citizens*	20, 103, 104
DePinto, Frank	27, 41, 105, 106
Dutton, Phil *Hollywood City Council*	16
Gay, John	21, 22
Gibson, Tom *Valley Radiology*	21
Gorenflo, Louise *Sierra Club-Tennessee Chapter*	4, 6, 11, 12, 18, 24, 37, 44, 46, 47, 51, 68, 69, 70, 93, 95
Guthrie, James	21
Horn, Stewart	9, 11, 12, 18, 23, 30, 35, 37, 42, 44, 47, 55, 68, 69, 70, 74, 75, 86, 89, 91, 93, 95, 98, 107, 109, 110
Johnson, Norman	21, 40
Jones, Charles	19, 83, 101
Kennamer, Donald	19, 21, 94
Lamberts, Frances	18, 23, 37, 44, 80, 85, 88, 100
Livingston, Jack	21
Martin, Harley	21
McCluney, Ross	12, 18, 35, 49, 57, 58, 80, 84
Morgan, Garry *BEST/BREDL/SCE/AEC*	3, 9, 8,10, 11, 12, 18, 24, 31, 41, 43, 47, 56, 65, 66, 99
Reed, Elijah	17, 26
Rogers, Goodrich *Jackson County Economic Development Authority*	21, 72, 94, 97
Safer, Don *Tennessee Environmental Council*	18, 25, 37, 44, 47
Sandin, James *Scottsboro Electric Power Board*	7, 19, 38, 39, 67
Schaum, Fred L 'Pete' *Alabama Development Office*	32, 40, 45, 92
Stiles, William	2, 21
Trenkle, David	21, 52

Name Business or Organization	Associated Comment Statement Numbers
Warr, Richard *Hollywood City Council*	96
Wilkinson, Duncan	19
Woodall, John	21, 71, 94
York, George	21, 92, 94
Zeller, Louis A *Blue Ridge Environmental Defense League*	1, 5, 18, 23, 25, 33, 36, 47, 48, 53, 54, 59, 60, 61, 62, 73, 77, 88, 90, 98, 102, 107

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APPENDIX D – SENSITIVE AREA REVIEW PROCESS

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Sensitive Area Review (SAR) Process

This attachment briefly summarizes the environmental compliance review process TVA uses for maintenance and modifications of transmission lines and presents the results of this process, by subject matter area.

Overview of Environmental Compliance Process for Transmission Line Maintenance and Modifications

The TVA Transmission and Power Supply – Transmission Operations and Maintenance (TPS-TOM) organization routinely conducts maintenance activities on transmission lines in the TVA system (TVA Power Service Area). These activities include, but are not restricted to, right-of-way reclearing (removal of vegetation), pole replacements, installation of lightning arrestors and counterpoise, and upgrading of existing equipment. Regular maintenance activities are conducted on a cycle of 3-5 years.

Prior to these activities, the transmission line area (including the right-of-way) is reviewed by technical specialists in the TVA Regional Natural Heritage Project, and TVA Cultural Resources group, to identify any resource issues that may occur along that transmission line. These reviews are conducted on a recurring basis that coincides with the maintenance cycle, to ensure that the most current information is provided to the organizations conducting maintenance on these transmission lines.

The TVA Regional Natural Heritage Project maintains a database of some 30,000+ occurrence records for protected plants, animals, caves, heronries, eagle nests, and natural areas for the entire TVA Power Service Area, including all 201 counties. All records that are present, or are potentially present, in transmission line right-of-ways are taken into consideration when conducting these transmission line reviews. Wetland information is maintained by TVA Resource Services and includes NWI wetland maps for the entire TVA Power Service Area. Soil survey maps are also used to identify potential wetland areas. The TVA Cultural Resources group maintains records of known archaeological sites, and routinely gathers information from the seven-state TVA Power Service Area.

Also included in this document is the explanation of Sensitive Area Review (SAR) Class Definitions and associated table of mapping polygon colors, and the restrictions indicated by those designations.

(Managed Areas) - Managed Areas, Ecologically Significant Sites, and National Rivers Inventory for Maintenance Activities in TVA Transmission Line Rights-of-Way

Managed Areas (MA) are lands held in public ownership that are managed to protect and maintain certain ecological features. Ecologically Significant Sites (ESS) are tracts of privately owned land that are identified by resource biologists as containing significant environmental resources. National River Inventory (NRI) streams are free-flowing river segments that are recognized by the National Park Service as possessing remarkable natural or cultural values. The TVA Natural Heritage Project maintains a database of all such lands and streams occurring within the seven state TVA power service area.

Sensitive area reviews for MA's, ESS's, and NRI streams are completed by utilizing computerized mapping graphics software known as ArcMap. If a MA, ESS, and/or NRI stream is located within the 0.5-mile buffer of the subject transmission line, a polygon is drawn that represents the area's boundaries within the buffer. A description of the area that includes contact information, restrictions, and the subject transmission line name is listed in the corresponding attribute table.

Right-of-way (ROW) maintenance and/or clearing and pole replacement activities are the two areas that are reviewed for the presence of sensitive resources in SARs. If all or any portion of a MA, ESS, and/or NRI stream lies within the buffer of the subject transmission line, a polygon is drawn depicting the boundary of such areas. Restrictions on proposed activities (Class 0, 1 2, or 3 below) are determined by the type and location of the MA, ESS, and/or NRI streams as well as consultation with the area manager or resource specialist. The class and contact restrictions, definitions, and polygon color for both activities are listed in the included table.

After determining the particular class restriction associated with the area, special instructions or comments are added to indicate the importance of the restriction and why it was assigned. For example, when a portion of a national forest is within the 0.5-mile buffer or crossed by the subject transmission line, a Class 3 restriction is assigned and a comment is added indicating the area manager must be contacted and herbicide use is restricted.

Under Categorical Exclusions, transmission line projects such as lightning mitigation, counterpoise activities, conveyances, line relocations for state highway department work, and providing delivery points and switches for substations are reviewed for potential impacts to MA's, ESS's, and NRI streams. A three mile radius of the project site(s) is reviewed for MA's, ESS's, and NRI streams that might be affected by the proposed activity.

(Botany) - State and Federal listed plant restrictions for Maintenance Activities in TVA Transmission Line Rights-of-Way

Botanical assessments are completed for Sensitive Area Reviews (SARs) in order to identify state and federally listed plants that occur within a five mile radius of the transmission line. Identifying the occurrences gives us the ability to identify habitats within a proposed project area that are sensitive and potentially require restrictions from activities. To identify rare plant and sensitive habitat locations we utilize the TVA Natural Heritage database, aerial photographs and USGS topographical maps.

Transmission line SAR activities include right-of-way (ROW) maintenance/reclearing and pole replacements. The review process for the two activities is different since they potentially impact vegetation in different ways. ROW maintenance consists of vegetation clearing with herbicides unless otherwise specified. Herbicides kill all vegetation that is sprayed. Mechanical clearing has less of an impact since many plants can tolerate being cut. Pole replacements potentially impact vegetation when vehicles and equipment drive on and in the vicinity of the ROW and the soil and the vegetation are disturbed. If there are sensitive plants in the vicinity we recommend different access routes to be taken and we notify individuals of sensitive areas to avoid. Restrictions are determined by our knowledge of the habitat requirements for rare plants and rare plant communities that occur within the vicinity of the ROW. Once a sensitive area is located a polygon designating the known or likely extent of that occurrence is drawn on an ArcMap electronic topographic map, and appropriate class restrictions are applied (see table of Class Definitions and Associated Polygon Colors of Sensitive Areas).

(Terrestrial Animals) - State and Federal Protected Terrestrial Animal restrictions for Sensitive Area Reviews (SARs) conducted in support of Maintenance Activities in TVA Transmission Line Rights-of-Way

The TVA Regional Natural Heritage Program keeps track of state and federal protected species reported from the seven-state region. The terrestrial animal portion of the data base includes all listed birds (breeding and large wintering aggregations), mammals, reptiles, and amphibians. In addition to specific species of animals, the terrestrial portion of the database also includes records of heronries and caves as they often are used by multiple species.

Each SAR project is reviewed for the presence of protected terrestrial animals. A 1-mile radius of the project site(s) is typically reviewed for each proposed activity along transmission lines. Once an occurrence is located a polygon designating the known or likely extent of that occurrence is drawn on an ArcMap electronic topographic map (see included maps), and appropriate class restrictions are applied (see included table of Class Definitions and Associated Polygon Colors of Sensitive Areas). Special comments or instructions accompany each entry as appropriate. For instance, if a cave is located along a powerline corridor schedule for vegetative maintenance, a 200-foot buffer is indicated around the opening of the cave and a "Hand Clearing Only" restriction is applied within the buffer. If the cave is used by a summer or hibernating colony of bats, appropriate time restrictions, as designated in specific recovery plans for each species, are also applied.

(Aquatic Animals) - State and Federal Protected Aquatic Animal restrictions for Maintenance Activities in TVA Transmission Line Rights-of-Way

The TVA Regional Natural Heritage Program keeps track of state and federal protected species reported from the seven-state region. Aquatic animal occurrence records are maintained and updated by TVA Heritage staff on a regular basis.

Each SAR project is reviewed for the known or likely occurrence of protected aquatic animals in streams in or adjacent to the transmission line right-of-way. A 10 mile buffer around the transmission line being reviewed is examined to determine the likely occurrence of protected aquatic animals. Once an occurrence is located, appropriate class restrictions are applied and the appropriate colored polygon is drawn around the resource area on an ArcMap electronic topographic map (see included maps and table of Class Definitions and Associated Polygon Colors of Sensitive Areas). All transmission line maintenance activities are currently conducted using Best Management Practices as outlined in Muncy (1999). Special comments or instructions (including designation of specific Streamside Management Zones) accompany each entry as appropriate.

(Wetlands) - Wetlands Review for Maintenance Activities in TVA Transmission Line Rights-of-Way

Prior to the performance of any maintenance activities in TVA transmission line ROWs, office-level reviews are conducted by Natural Heritage wetland biologists. This review includes review of the National Wetland Inventory (NWI) map, county soil surveys, and TVA photos of transmission line structures. Potential wetland areas, not indicated on the NWI map, are identified based on interpretation of topographic features, water bodies, soils information, TVA photos and proximity to NWI features. All NWI wetlands or potential wetland areas are superimposed as layers on an ArcMap electronic topographic map (see included maps). These ArcMap images are sent to the client accompanied by the Wetlands ROW and Pole Replacement Guidelines and an Excel spread sheet which lists areas that have been included with the NWI data as areas of potential wetlands and what guidelines are to be used.

The NWI wetlands are indicated (in dark blue outline) on the ArcMap drawings for both the ROW and a 1-mile diameter buffer area around the ROW. Potential wetland areas are identified (in dark pink outline) in the ROW, but are not identified in the buffer area, parts of which may be used for ROW access. If the access route follows an existing road that does not require any repair or upgrading, no further wetland reviews are needed. Repair and upgrading includes, but is not limited to grading, fill addition, new or upgraded stream crossings, and vegetation removal. If a new or upgraded access route is necessary, environmental reviews of those particular access areas are conducted as required by the National Environmental Policy Act (NEPA).

The National Wetland Inventory (NWI) data was compiled using high-altitude aerial photography, some of which is now over 15 years old, with very limited field verification.

Because of this, some of the NWI data may be inaccurate. The limitations of the NWI data are considered in the performance of ROW maintenance and pole replacement to avoid accidental wetland impacts. Since there could be wetlands present for which no map evidence or other data currently exists, maintenance crews remain alert to such things as water on the surface of the ground, soil saturation, the type of vegetation growing in an area, and evidence of present, seasonal or temporary flooding.

In the absence of a ground survey by a wetlands specialist to determine wetland presence and location for ROW reclearing or pole replacements, Best Management Practices, as described in Muncy (1999), and TPS Environmental Quality Specifications for ROW Construction and Maintenance are implemented to avoid and minimize potential impacts (see attached Wetlands Guidelines for ROW and Pole Replacement). These techniques would be implemented in all locations where NWI wetlands and potential wetland areas are indicated on the project maps submitted by the TVA Natural Heritage staff.

Site-specific recommendations for ROW reclearing include the following:

- Depending on site conditions, Level B tree-cutting guidelines, or methods CM-2, CM-3, CM-4, or CM-5 may be used for tree clearing (Muncy 1999). These methods specify techniques for tree clearing and removal that are selected based on wetland hydrology and condition in order to avoid and minimize wetland impacts.
- According to method CM-6 (Muncy 1999), if the wetland is a scrub-shrub, emergent, or grazed wetland, there should be no equipment entry, and minimal intrusion by all mechanized equipment.
- For aerial or ground herbicide application, use is restricted to those herbicides that are EPA-approved for use in aquatic areas.
- If possible, mechanical clearing should be conducted when the ground is dry or minimally saturated. Ruts should be minimized to avoid altered hydrologic patterns, soil compaction, and disruptions in vegetation regeneration.

Specific recommendations for pole replacement activities include the following:

- Entry of vehicles or heavy equipment in wetlands should be avoided when possible.
- If entry is unavoidable, appropriate measures such as mats and low-ground pressure equipment should be used.
- Impacts to vegetation should be avoided or minimized.

In addition, certain activities that may occur during pole replacement in wetlands are regulated under Sections 404 and 401 of the Clean Water Act. U.S. Army Corps of

Engineers (USACE) Nationwide General Permit (NWP) #12 authorizes certain activities related to utility line construction and contains conditions to ensure that impacts to wetlands are minimal. Section 401 gives states the authority to certify whether activities permitted under Section 404 are in accordance with state water quality standards (Strand, 1997). A qualified TVA or TVA contract wetlands specialist would be required to delineate the wetland(s) and provide the wetland determination data forms which are required for inclusion in the permit application. TVA also follows Executive Order 11990 which requires all federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands, in carrying out the agency's responsibilities.

Potential impacts to wetlands resulting from right-of-way maintenance activities include vegetation damage, soil compaction and erosion, sedimentation, and hydrologic alterations. These impacts are avoided or minimized during TVA maintenance operations by following the recommendations of the guidelines presented above and implementing all relevant Best Management Practices. In addition, the appropriate permits are obtained if required for the specific activity.

(Cultural) - Cultural Resource Reviews Related to Operations and Maintenance Activities in TVA Transmission Line Rights-of-Way

Regulatory Background

The National Historic Preservation Act of 1979 (NHPA) made historic preservation a statutory and regulatory responsibility of federal government agencies and established procedures to be followed for historic preservation. Generally speaking, any TVA action involving construction and/or ground disturbing activity is subject to NHPA. The concepts "historic property" and "undertaking" are critical underpinnings of the Act. The NHPA defines historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places." The Secretary of the Interior is the Keeper of the National Register of Historic Places ("the National Register"), which is maintained by the National Park Service. Much of the regulatory language of the Act describes the processes by which districts, sites, buildings, or structures are assessed for listing in the National Register. An undertaking is "a project, activity, or program funded in whole or in part under the direst or indirect jurisdiction of a Federal Agency."

Section 106 of the NHPA requires TVA to 1) consider the effect of its actions on historic properties and 2) allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: 1) initiate the process; 2) identify historic properties; 3) assess adverse effects; and 4) resolve adverse effects. One of the main responsibilities of TVA Cultural Resources is to carry out these four steps. The process involves documentary research and field reconnaissance for identifying cultural resources (such as artifacts, sites, or historic structures); determining whether any identified cultural resources are eligible for listing on the National Register, and therefore should be considered "historic properties"; assessing whether a proposed undertaking will cause adverse affects to any historic properties; and recommending ways to resolve adverse effects, namely avoidance or mitigation. This process is carried out in consultation with the State Historic Preservation Officer of the state in which the undertaking takes place and with any other interested consulting parties including federally recognized Indian tribes.

The construction, maintenance, and operation of TVA transmission lines all constitute undertakings and as such are subject to the NHPA and its implementing regulations at 36CFR800. Examples of maintenance activities associated with transmission lines are spraying herbicides and replacing individual poles. Such activities are reviewed by TVA Cultural Resources staff on a case-by-case basis using the Sensitive Area Review (SAR) procedure. The purpose of an SAR Cultural Resources review is to identify whether the undertaking has any potential for adverse effects on cultural resources such as historic structures or buried prehistoric sites. If the undertaking does have potential for adverse effects, then procedures for avoidance or mitigation of the effects are put into place.

How TVA Cultural Resources Conducts SARs for Transmission Operations and Maintenance Projects

TVA Cultural Resources staff examine topographic maps of the project site for (a) previously recorded archaeological sites in the vicinity of the transmission line corridor; and (b) conditions that suggest high potential for archaeological sites including low slope (< 10%), proximity to major water sources, and lack of modern disturbance. ArcView GIS is used to identify areas with potential for cultural resources. The decision to do a field review is based on such information along with any information the staff can glean from videos of the transmission line corridors and from still photographs of the project site.

Field reviews are conducted by Cultural Resources staff or by consulting archaeologists, who look for signs of intact, buried prehistoric deposits using surface survey and sub-surface probes (when appropriate). The project is cleared if no artifacts or features identified and if the project site appears to have a low potential for cultural resources. If intact buried deposits containing cultural resources are discovered, an attempt is made to discern whether the site may be potentially eligible for the National Register. A formal assessment of eligibility would not be undertaken during a field review, however. If the site may be eligible, then a Phase I investigation is called for. A Phase I might also be called for there is a high potential for intact buried deposits, even if no artifacts or features were identified during field review. The purposes of a Phase I investigation are to delimit the boundaries of a site, gather additional information relating to the site's eligibility (such as integrity), and assess possible effects to the site from the undertaking.

Avoidance is generally feasible for transmission line maintenance projects when cultural resources are present. ArcView GIS is used to generate a map showing polygons around those cultural resources, representing sensitive areas. Areas that are sensitive from the standpoint of cultural resources are coded Level 2, which indicates restrictions on methods of clearing (no mechanized equipment). These maps are provided to TPS prior to any maintenance activities on the line, so that crew supervisors will be aware of the necessary restrictions. Restrictions are typically called for when a previously recorded cemetery, prehistoric mound, or earthwork occurs within 0.25 miles of the transmission line.

Class Definitions and Associated Polygon Colors of Sensitive Areas for RIGHT-OF-WAY RECLEARING Sensitive Area Reviews

Class	Restriction if Sensitive area in ROW	Restriction for Sensitive Areas Potentially Affected when <u>Accessing</u> ROW	Polygon Color
Terrestrial Plants (A), Terrestrial Animals (D), and Aquatic Animals (E)			
1	No broadcast spraying. Use one of the three following alternatives: 1) Hand or mechanical clearing, 2) Request field surveys by TVA Heritage staff to determine if suitable habitat for these species exists in the subject area, 3) Selective spraying of herbicides to shrubs or tree saplings less than 12 feet in height.	Not Applicable	Yellow
2	Hand-clearing only. Vehicles and equipment restricted from area unless confined to existing access road. Special circumstance. **Must contact Heritage Botanist** prior to entering or conducting maintenance in subject area.	Vehicles and equipment restricted from area unless confined to existing access road.	Red
0	Special circumstance. Terrestrial Animals - Indiana Bat Summer Roosting Habitat - Trees can only be cut between November 15 and March 31. If cutting is necessary outside of this time restriction, a bat mist-net survey is necessary.		Green
Wetlands* (C)			
-	Wetlands obtained from National Wetland Inventory data. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.		Blue Outline
1	Potential wetlands identified by Natural Heritage wetland biologists based on interpretation of topographic features, water bodies, soil surveys and proximity to NWI features. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.		Pink Outline

Natural Areas (B)			
Class	**Call****	**Definition**	**Color**
1	No	Same as Class 1 definition above.	Yellow
2	No	Same as Class 2 definition above.	Red
1	Yes	Same as Class 1 definition above, and **must contact area manager** prior to entering or conducting maintenance in subject area	Yellow hatching
2	Yes	Same as Class 2 definition above, and **must contact area manager** prior to entering or conducting maintenance in subject area.	Red hatching
3	Yes	**Must contact area manager** prior to entering or conducting maintenance in subject area.	Neon Green
0		Special circumstance.	Green

Archaeology (F)			
Class	**Restriction if Sensitive area in ROW**	**Restriction for Sensitive Areas Potentially Affected when Accessing ROW**	**Color**
1	Mechanical clearing must be conducted when the ground is dry and firm. If bulldozer is used, blade must be kept above ground surface to avoid ground disturbance. Material from clearing (timber, brush, and large debris) must be removed from sensitive area.	Vehicles and equipment must be confined to existing access road.	Yellow
2	No mechanical clearing. Hand-clearing only (chainsaws may be used but not heavy equipment). Debris from clearing must be hand-carried out of sensitive area.	All vehicles must be low-pressured tire equipment and must be confined to existing access road.	Red

* Refer to Wetlands Statement included in this package.
** The "Call" column on the accompanying datasheets is used by Natural Area specialists only. A blank in the column indicates no call is necessary.

Class Definitions and Associated Polygon Colors of Sensitive Areas for POLE REPLACEMENT Sensitive Area Reviews

All Resources Areas (Plants, Natural Areas, Wetlands, Terrestrial Animals, and Aquatic Animals)		
Class	**Restriction**	**Color**
1	**Botany**: Sensitive Botanical resources are known from the area. Details of proposed activities should be submitted to TVA Heritage staff to determine if the proposed activities require restrictions. **Natural Areas**: Refer to table accompanying project for restrictions. **Wetlands**: Potential wetlands identified by Natural Heritage wetland biologists based on interpretation of topographic features, water bodies, soil surveys and proximity to NWI features. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions. **Terrestrial Animals**: Refer to table accompanying project for restrictions. **Aquatic Animals**: Refer to table accompanying project for restrictions.	Pink
Wetlands		
-	Wetlands obtained from National Wetland Inventory data. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.	Blue Outline
Archaeology		**Color**
Class	**Restriction**	
1	Presence of significant below-ground cultural resources is highly likely. Work must be scheduled when ground is dry and firm. Only vehicles with low-pressured tires may be used within sensitive area. If structure is a pole, new poles must be placed in existing holes; if structure is a tower, existing footings must be used for new tower. If guy wires are used, existing guy wire anchors must be used for new structure. If any of these conditions can not be met, then details of proposed activities (nature of work, date work is to take place) must be submitted to TVA Cultural Resources staff so that a field review can be scheduled.	Yellow
2	Presence of significant cultural resources is known. Work schedule must be submitted to TVA Cultural Resources staff so that a field review can be scheduled.	Red

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APPENDIX E – CORMIX MODELING RESULTS

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Table E-1. Summary of CORMIX Model Results

Plant	Case	Month	Ambient River Conditions		Blowdown Conditions		Conditions at Edge of Mixing Zone			
			Flow	Temp	Discharge	Temp	Temp	Temp Rise	Plume Width	Plume Thickness
			(cfs)	(°F)	(cfs)	(°F)	(°F)	(°F)	(feet)	(feet)
36-inch Diameter, 45-foot Long Diffuser Pipe										
B&W	1	March	3130	41.0	50	86.4	43.2	2.2	246	8
B&W	2	April	190	52.0	50	90.4	53.9	1.9	249	8
B&W	3	July	3760	89.5	50	97.7	89.9	0.4	193	10
B&W	4	March	-9160[1]	41.0	50	86.4	44.4	3.4	343	9
AP 1000	1	March	3130	41.0	18	86.4	43.1	2.1	444	4
AP 1000	2	April	190	52.0	18	90.4	53.9	1.9	424	5
AP 1000	3	July	3760	89.5	18	97.7	89.9	0.4	337	5
AP 1000	4	March	-9160[1]	41.0	18	86.4	42.4	1.4	348	7
42-inch Diameter, 75-foot Long Diffuser Pipe										
B&W	1	March	3130	41.0	50	86.4	43.6	2.6	368	6
B&W	2	April	190	52.0	50	90.4	54.3	2.3	356	7
B&W	3	July	3760	89.5	50	97.7	90.0	0.5	286	8
B&W	4	March	-9160[1]	41.0	50	86.4	43.3	2.3	442	10
AP 1000	1	March	3130	41.0	18	86.4	43.5	2.5	758	3
AP 1000	2	April	190	52.0	18	90.4	54.3	2.3	625	4
AP 1000	3	July	3760	89.5	18	97.7	89.8	0.3	632	7
AP 1000	4	March	-9160[1]	41.0	18	86.4	42.0	1.0	375	10

Notes: [1]Reverse river flow with diffuser ports pointing vertically upward

cfs = cubic feet per second

°F = degrees fahrenheit

Table E-2. Summary of 1999 Guntersville Reservoir Model Results[1]

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.
[2]All values are based on model results at the 5-foot depth
[3]Max day is the maximum daily value for the entire year
[4]Mean is the average of the 6-hour model outputs over the designated time period
[5]Min. day is the minimum daily value for the entire year

Table E-3. Summary of 2007 Guntersville Reservoir Model Results[1]

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°C)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	86.5	77.0	83.8	86.9	77.4	84.2	87.2	77.5	84.4	88.5	78.4	85.5
Base	86.5	77.0	83.8	88.4	79.0	85.6	88.3	79.0	85.7	88.6	78.5	85.7
B&W	86.5	77.0	83.8	88.4	79.0	85.6	88.3	79.1	85.7	88.7	78.5	85.7
AP 1000	86.5	77.0	83.8	88.4	79.0	85.6	88.3	79.0	85.7	88.7	78.5	85.7
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.5	5.6	7.1	8.9	8.5
Base	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.4	5.5	6.9	8.9	8.5
B&W	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.4	5.5	6.9	8.9	8.5
AP 1000	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.4	5.5	6.9	8.9	8.5
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.4	0.2	0.1	0.5	0.2	0.2	3.8	2.8	3.1
Base	0.1	0.0	0.0	0.3	0.1	0.1	0.4	0.2	0.2	3.9	2.9	3.1
B&W	0.1	0.0	0.0	0.3	0.1	0.1	0.4	0.2	0.2	3.9	2.9	3.1
AP 1000	0.1	0.0	0.0	0.3	0.1	0.1	0.4	0.2	0.2	3.9	2.9	3.1

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the period April through September

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the period April through September

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.
[2]All values are based on model results at the 5-foot depth
[3]Max day is the maximum daily value for the entire year
[4]Mean is the average of the 6-hour model outputs over the designated time period
[5]Min. day is the minimum daily value for the entire year

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.
[2]All values are based on model results at the 5-foot depth
[3]Max day is the maximum daily value for the entire year
[4]Mean is the average of the 6-hour model outputs over the designated time period
[5]Min. day is the minimum daily value for the entire year

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

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APPENDIX F – WETLANDS FIELD DELINEATION AND HABITAT ASSESSMENT FORMS

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TVA Natural Heritage Project Routine Wetland Determination Form

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, H. Hart	Normal Circumstances:	y	Sample ID:	W001
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 6, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Quercus phellos*	Tr	Facw+	9.	*Toxicodendron radicans*	WV	Fac
2.	*Quercus nigra*	Tr	Fac	10.	*Carex tribuloides*	H	Facw
3.	*Quercus pagoda*	Tr	Fac+	11.	*Ulmus americana*	Tr	Facw
4.	*Pinus taeda*	Tr	Fac	12.	*Ulmus thomasii*	Tr, Sh	Fac
5.	*Acer rubrum*	Tr	Fac	13.	*Impatiens sp.*	H	Facw
6.	*Liquidambar styraciflua*	Tr, Sh	Fac+	14.			
7.	*Ilex decidua*	Sh	Facw-	15.			
8.	*Berchemia scandens*	WV	Facw	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water: 0-6 (in.)
Depth to Free Water in Pit: 11 (in.)
Depth to Saturated Soil: 8 (in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
y	Inundated		Drift Lines	y	Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks	y	Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks: wet weather drainage to Town Creek embayment on Guntersville Reservoir

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-2	10 YR 6/2	-	-	Loam
2-8	10 YR 6/4	-	-	Silt loam
8-12	10/YR 6/4	10 YR 6/2	Common	Silty clay loam

Hydric Soil Indicators:

	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Soil color not quite hydric (chroma is too high); lots of evidence of extensive soil disturbance in past;

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

Estimated size: 2.95 acres

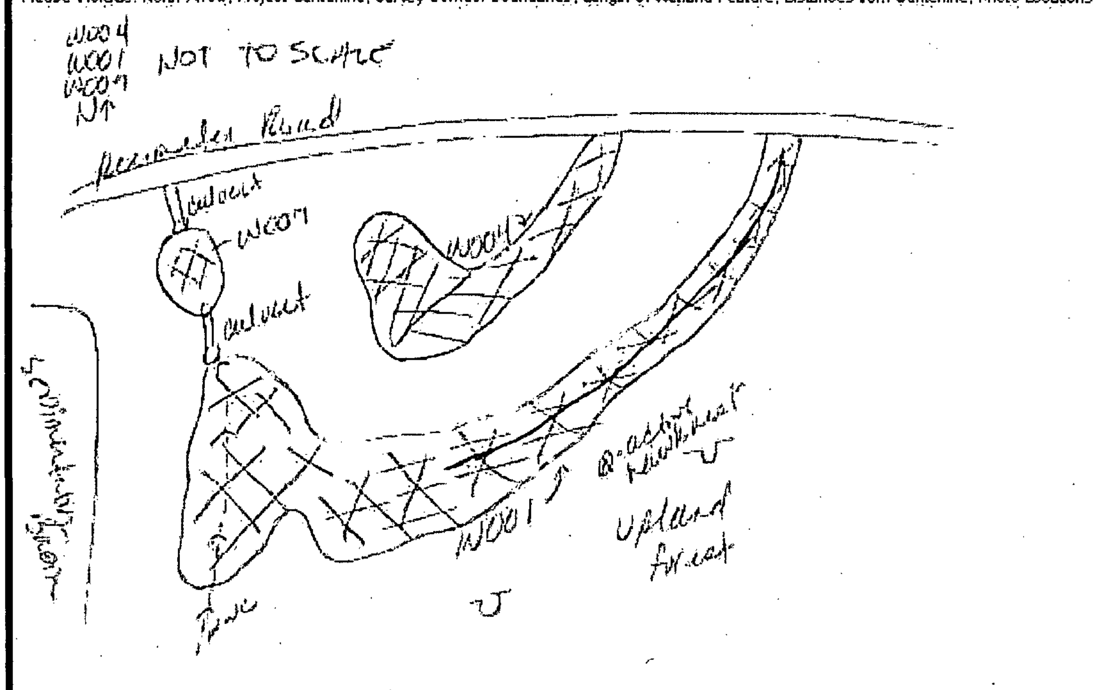
Wetland Descriptors

Sample ID: W001	Photo ID(s): W01-1W, W01-2W, W01-3W

Flagging Description: 1-29 counterclockwise from NW corner near culvert around to east; 30-70 clockwise from #1 around north side back to #29

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	y	Yes		No	Waterbody/Watershed: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)						
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking	2	Sheet Flow	3	Groundwater	4	Precipitation	Other
TVA RAM SCORE:	63.5	TVARAM CATEGORY:	Category 3								

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc).**

Flatwood forested wetland
Small perched wetland/vernal pool in center of eastern end; numerous scattered depressions with water-stained leaves
Obvious signs of soil disturbance and earth-moving in past

TVA Natural Heritage Project Routine Wetland Determination Form

Project: Bellefonte NP REO 10389	Investigator: J. Groton, H. Hart	Normal Circumstances:	y	Sample ID:	W002
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 6, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Carpinus caroliniana*	Tr, Sh	Fac	9.	*Toxicodendron radicans*	WV	Fac
2.	*Quercus nigra*	Tr	Fac	10.	*Ulmus americana*	Tr	Facw
3.	*Quercus pagoda*	Tr	Fac	11.	*Ulmus thomasii*	Tr, Sh	Fac
4.	*Pinus taeda*	Tr	Fac	12.	*Impatiens sp.*	H	Facw
5.	*Acer rubrum*	Tr	Fac	13.			
6.	*Liquidambar styraciflua*	Tr, Sh	Fac+	14.			
7.	*Ilex decidua*	Sh	Fac	15.			
8.	*Berchemia scandens*	WV	Facw	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

- Depth of Surface Water: 0-4 (in.)
- Depth to Free Water in Pit: - (in.)
- Depth to Saturated Soil: 8 (in.)

Wetland Hydrology Indicators:

Primary Indicators

- y Inundated
- y Saturated in Upper 12 in.
- Sediment Deposits
- Drift Lines
- Water Marks
- y Drainage Patterns

Secondary Indicators

- y Oxidized Root Channels
- y Water Stained Leaves

Remarks: wet weather drainage to Town Creek embayment on Guntersville Reservoir

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No

Profile Description:

Depth (inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-2	10 YR 4/2	-	-	Silt loam
2-5	10 YR 5/2	-	-	Silt loam
5-9	10 YR 7/3	10 YR 7/2	Common	Silty clay
9-12	10 YR 7/3	10 YR 7/2	Common	Clay

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
y	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No N

Estimated size: 4.52 acres

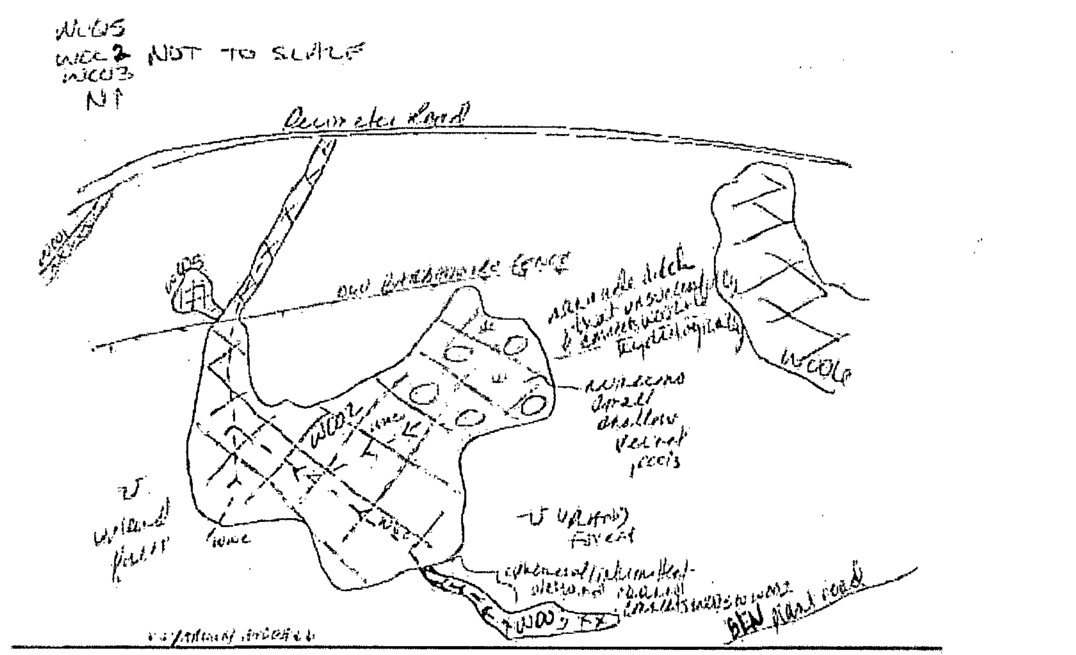
Wetland Descriptors

Sample ID: W002	**Photo ID(s)**: W02-1W, W02-2W, W02-3W, W02-4W, W02-5W, W02-6W, W02-7W, W02-8W, W02-9W

Flagging Description: W2-1 to W2-16 clockwise from southern edge around to northwest corner, W2A-1 to W2A-43 clockwise from northeastern corner back to W2-1

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	y	Yes		No	Waterbody/Watershed: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)					
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking	3	Sheet Flow	2	Groundwater	4	Precipitation		Other

TVARAM SCORE:	69	**TVARAM CATEGORY:**	Category 3

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

Flatwood forested wetland
Wetland will receive stormwater runoff from construction area
Obvious signs of soil disturbance and earth-moving in past
Several perched wetlands/vernal pools scattered about northeastern lobe of wetland
Numerous large trees (18-24+ inches DBH) throughout wetland but especially in northeastern lobe
There is a ditch near the northeast corner that looks like someone attempted (unsuccessfully) to connect W02 to W06, about 100-150 feet to the north

TVA Natural Heritage Project Routine Wetland Determination Form

Project: Bellefonte NP REO 10389	Investigator: J. Groton, H. Hart	Normal Circumstances:	y	Sample ID:	W003
County: Jackson		Atypical Situation:	y	Station or Structure Number(s):	
State: AL	Date: April 6, 2006	Problem Area:	n	Cowardin Code:	PFO1B

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Ligustrum sinense*	Sh	Fac	9.	*Glyceria striata*	H	Obl
2.	*Celtis laevigata*	Tr	Facw	10.	*Ulmus thomasii*	Tr, Sh	Fac
3.	*Fraxinus pennsylvanica*	Sh, Sap	Facw	11.	*Quercus michauxii*	Tr	Facw-
4.	*Berchemia scandens*	WV	Facw	12.			
5.	*Ulmus alata*	Tr	Facu+	13.			
6.	*Carex cherokeensis*	H	Facw-	14.			
7.	*Nothoscordum bivalve*	H	Fac	15.			
8.	*Sanicula sp.*	H	Fac-Facu	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 82%

Hydrology

Field Observations:

Depth of Surface Water:	0-1	(in.)
Depth to Free Water in Pit:	-	(in.)
Depth to Saturated Soil:	7	(in.)

Wetland Hydrology Indicators:

Primary Indicators		Primary Indicators		Secondary Indicators	
y	Inundated		Drift Lines		Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks: Headwater of unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir); connects by drainage channel to W02

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-3	10 YR 3/2	-	-	Silt loam
3-6	10 YR 5/3	10 YR 6/2	Common	Silt loam
6-12	10 YR 6/2	10 YR 6/6	Common	Silty clay

Hydric Soil Indicators:

	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Soil color not quite hydric (chroma in second horizon too high); lots of evidence of extensive soil disturbance in past.

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

Estimated size: 0.28 acre

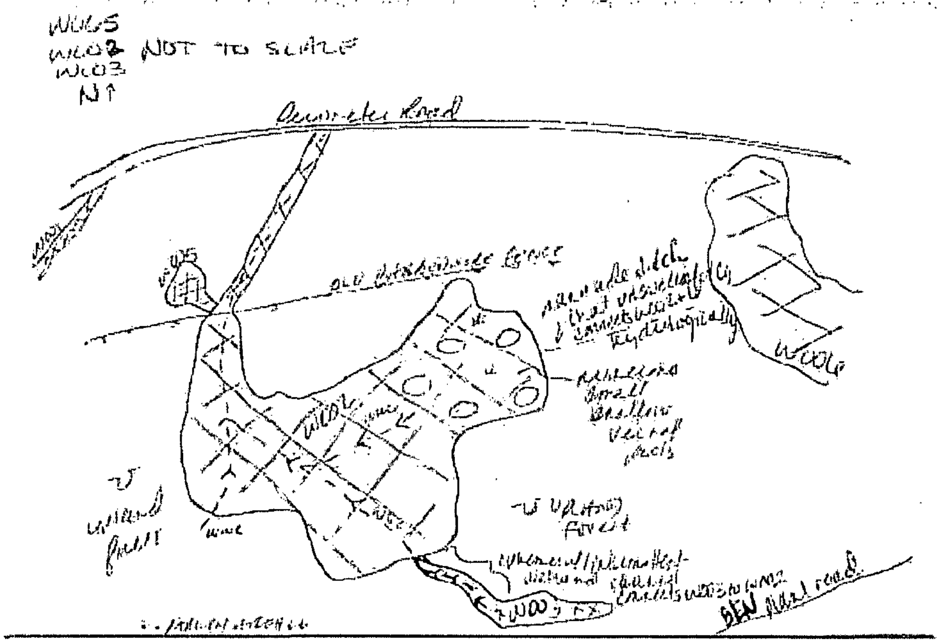
Wetland Descriptors

Sample ID: W003	**Photo ID(s):** W03-1W, W03-2W

Flagging Description: 1-19 counterclockwise from northwest

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?		Yes		No	Waterbody/Watershed: Headwater of unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)					
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking	2	Sheet Flow	1	Groundwater	3	Precipitation		Other

TVARAM SCORE:	35	**TVARAM CATEGORY:**	Category 2

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)**

Small area of forested wetland; partially intersects potential construction area (~0.25 acre inside construction footprint). It will also be affected by proposed haul road to site and module assembly areas

Wetland is connected to Wetland W02 by wet weather conveyance but higher in watershed

Possible small seep near southern edge

Project: Bellefonte NP REO 10389	Investigator: J. Groton, B. Dimick	Normal Circumstances:	y	Sample ID:	W004
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 26, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr, Sh, Sap	Facw	9.	*Nothoscordum bivalve*	H	Fac
2.	*Quercus phellos*	Tr, , Sap	Facw-	10.	*Galium aparine*	H	Facu
3.	*Ulmus americana*	Tr, Sh	Facw	11.	*Diospyros virginiana*	Sap	Fac
4.	*Campsis radicans*	Sap	Fac	12.	*Toxicodendron radicans*	WV, Sap	Fac
5.	*Berchemia scandens*	WV	Facw	13.	*Lycopus sp*	H	Obl
6.	*Ampelopsis arborea*	Sap	Fac+	14.	*Glyceria striata*	H	Obl
7.	*Ilex decidua*	Sh	Facw	15.	*Several unidentified Carex species*	H	
8.	*Pinus taeda*	Tr	Fac	16.	*moss*	H	

Percent of Dominant Species That are OBL, FACW, or FAC: 93%

Hydrology

Field Observations:

Depth of Surface Water:	0-12	(in.)	
Depth to Free Water in Pit:	3	(in.)	
Depth to Saturated Soil:	0	(in.)	

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
y	Inundated		Drift Lines		Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	x	Drainage Patterns		

Remarks: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-3	10 YR 5/3	10 YR 5/6	Common	Silty clay loam
3-10	10 YR 6/2	10 YR 5/6	Common	Silty clay loam
10-12+	10 YR 6/1	10 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

Y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	Y	Reducing Conditions
Y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

	Yes		No			Yes		No	
Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

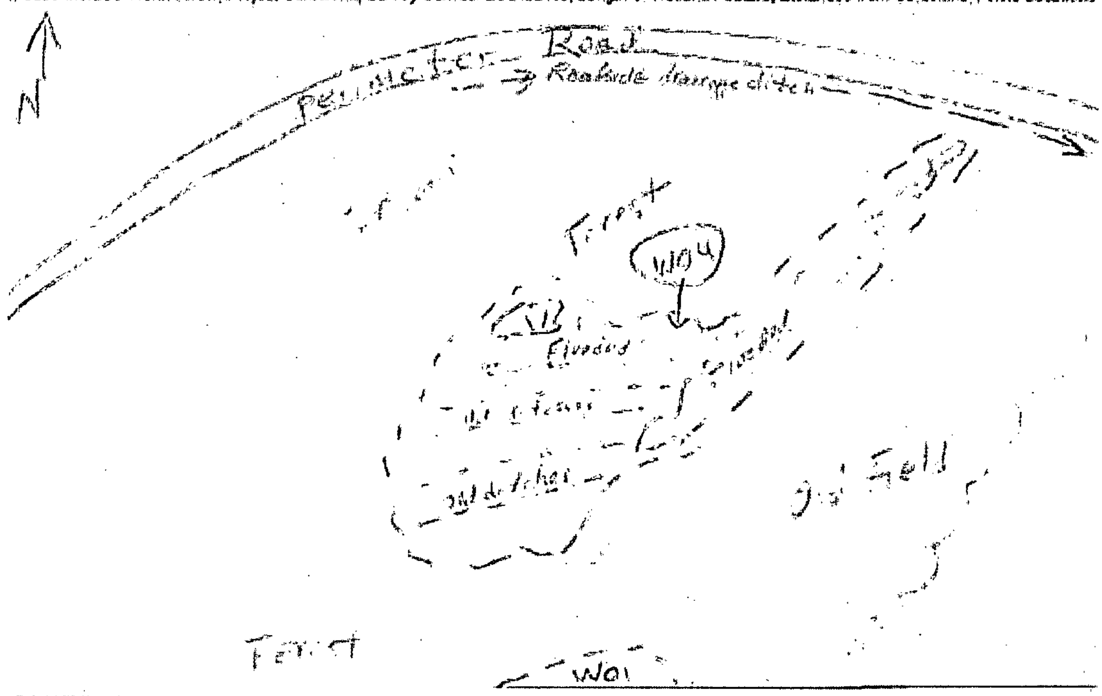
Estimated size: 1.81 acres

Wetland Descriptors

Sample ID. W004	**Photo ID(s):** W04-1W (northern end), W04-2W (center of wetland), W04-3W (southern end)
Flagging Description: 1-48 clockwise from northeast corner	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	Y	Yes		No	Waterbody/Watershed. Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)						
Primary Water Source (if other, note in comments)		Cap. Fringe	2	Overbank	1	Sheet Flow		Groundwater	3	Precipitation	Other
TVARAM SCORE:	55	**TVARAM CATEGORY:**	Category 2								

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

Young forested wetland formed in flooded drainageway
No evidence of beaver
Wetland drains into drainage ditch beside perimeter road
Drainage is impeded where wetland W04 intersects with the roadside drainage ditch – no evidence of plugged culvert
There are several shallow, linear ditches in the upper end of W04 (southern end) that run transverse to main axis of wetland. These appear to be the result of a past attempt to drain part of the wetland?
Gray Tree Frogs

Project: Bellefonte NP REO 10389	Investigator: J. Groton, B. Dimick	Normal Circumstances:	y	Sample ID:	W005
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 26, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr, Sh, Sap	Facw	9.	*Ulmus alata*	Tr, Sh	Facu+
2.	*Microstegium vimineum*	H	Fac+	10.	*Rumex crispus*	H	Fac
3.	*Toxicodendron radicans*	WV, Sap	Fac	11.	*Ilex decidua*	Sh	Facw
4.	*Ulmus thomasii*	Tr, Sh	Fac	12.	*Populus deltoides*	Tr	Fac+
5.	*Carex cherokeensis*	H	Facw-	13.	*Berchemia scandens*	Sap	Facw
6.	*Senecio sp.*	H	-	14.			
7.	*Salix*	Tr, Sh	Obl	15.			
8.	*Lonicera japonica*	WV, Sap	Fac-	16.			
Percent of Dominant Species That are OBL, FACW, or FAC: 77%							

Hydrology

Field Observations:

Depth of Surface Water: 0-4 (in.)
Depth to Free Water in Pit: >12 (in.)
Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
y	Inundated		Drift Lines		Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits		Drainage Patterns		

Remarks: Isolated, perched wetland on terrace of WWC draining W02; ~25 feet from channel but no obvious connection to stream channel

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-12+	10 YR 4/2	7.5 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

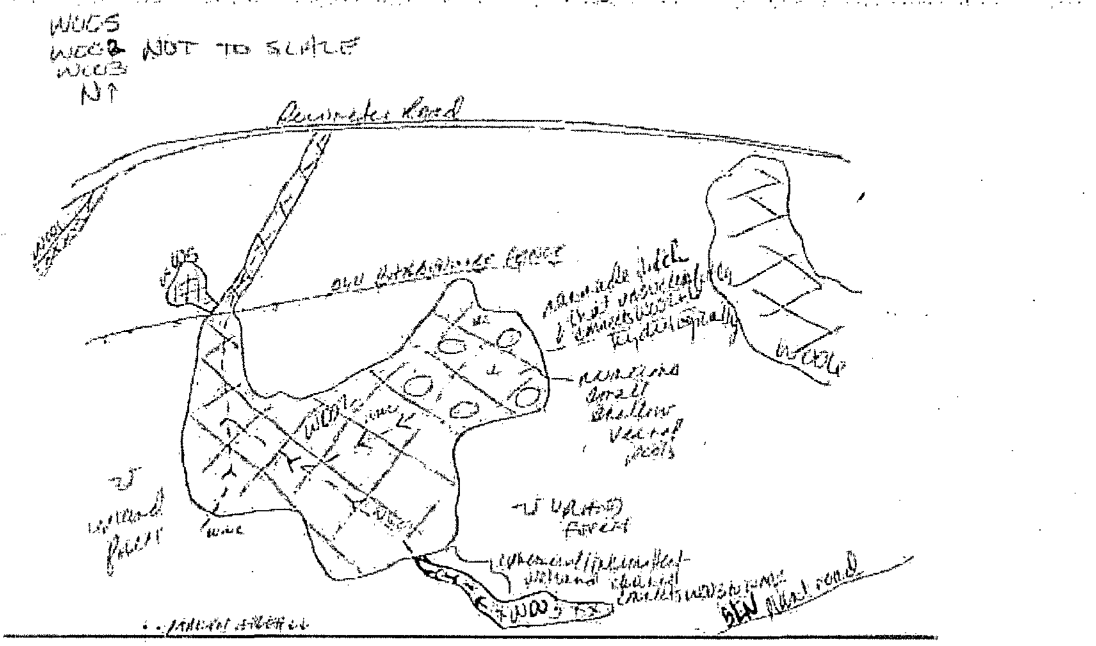
Estimated size: 0.26 acre

Wetland Descriptors

Sample ID: W005	**Photo ID(s):** W05-1W, W05-2W, W05-3W, W05-4W
Flagging Description: 1-17 clockwise from southern tip of wetland	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?		Yes	x	No	Waterbody/Watershed:							
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking	2	Sheet Flow		Groundwater	1	Precipitation		Other
TVARAM SCORE:	60	**TVARAM CATEGORY:**	Category 3									

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances; adjacent land use, wildlife observations, station numbers, lat-long, etc)

Shallow, perched wetland or vernal pool on terrace of wet weather conveyance draining Wetland W02

Wetland W05 is about 25 feet from conveyance channel with no obvious signs of a direct hydrologic connection to the stream channel, even during high flows

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, B. Dimick	Normal Circumstances:	y	Sample ID:	W006
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 26, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr	Facw	9.	*Glyceria striata*	H	Obl
2.	*Liquidambar styraciflua*	Tr	Fac+	10.	*Polygonum sp.*	H	-
3.	*Quercus phellos*	Tr	Facw-	11.	*Gratiola neglecta*	H	Obl
4.	*Ilex decidua*	Sh	Facw	12.	*Ligustrum sinense*	Sh	Fac
5.	*Berchemia scandens*	W	Facw	13.	*Impatiens sp.*	H	Facw
6.	*Smilax glauca*	W	Fac	14.	*Carpinus caroliniana*	Tr, Sh	Fac
7.	*Galium aparine*	H	Facu	15.	*Campsis radicans*	Sap	Fac
8.	*Celtis laevigata*	Tr	Facw	16.	*Moss*	H	-

Percent of Dominant Species That are OBL, FACW, or FAC: 88%

Hydrology

Field Observations:

Depth of Surface Water:	0-12	(in.)
Depth to Free Water in Pit:	3	(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
y	Inundated		Drift Lines		Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 3/2	-	-	Silty clay loam
4-12+	10 YR 5/2	10 YR 5.6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

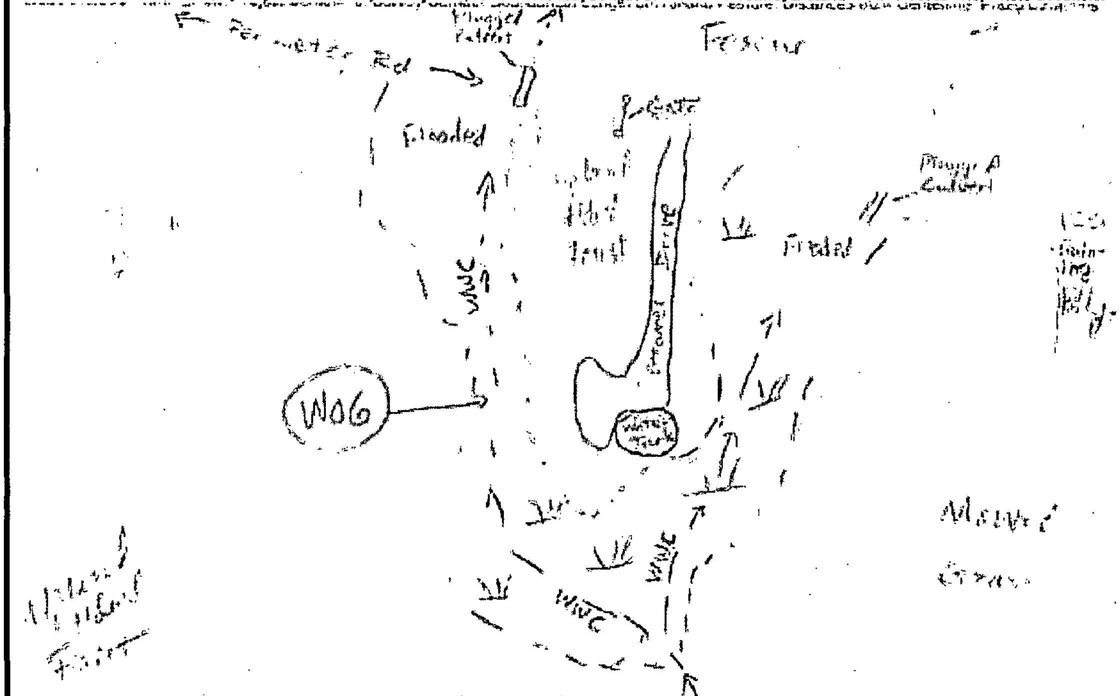
Estimated size: 2.36 acres

Wetland Descriptors

Sample ID W006	**Photo ID(s):** W06-1W (northeastern end), W06-2W (center of wetland), W06-3W (northwestern end)
Flagging Description: 1-75 clockwise from the northwest corner	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Two unnamed drainages (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)						
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking		Sheet Flow	2	Groundwater	3	Precipitation	Other
TVARAM SCORE:		**TVARAM CATEGORY:**									

Description of Wetland and Other Comments: (i.e., forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc.)

There is a ditch near the northeast corner that looks like someone attempted (unsuccessfully) to connect W06 to W02, about 100-150 feet to the south

Wetland W06 is fed by a wet weather conveyance that enters the wetland from the south and splits into two channels, one that flows northeast and a second that flows northwest. Both channels exit through culverts under the perimeter road. Both culverts are plugged with debris and water has ponded up at both culverts south of the perimeter road

There appears to be some local groundwater influence (high water table) although no seeps or springs were observed

Grey tree frog, cricket frog, crayfish middens

Project: Bellefonte NP REO 10389	Investigator: B. Dimick, K. Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W007
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: September 1,2009	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr	Facw	9.			
2.	*Celtis laevigata*	Tr	Facw	10.			
3.	*Berchemia scandens*	WV	Facw	11.			
4.	*Populus deltoides*	Tr	Fac	12.			
5.	*Ligustrum sinense*	Sh	Fac	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	0	(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
n	Inundated		Drift Lines	y	Oxidized Root Channels
n	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks: small drainage feature between 2 culverts

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 3/2	-	-	Silty clay loam
4-12+	10 YR 5/2	10 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

	Yes		No			Yes		No	
Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

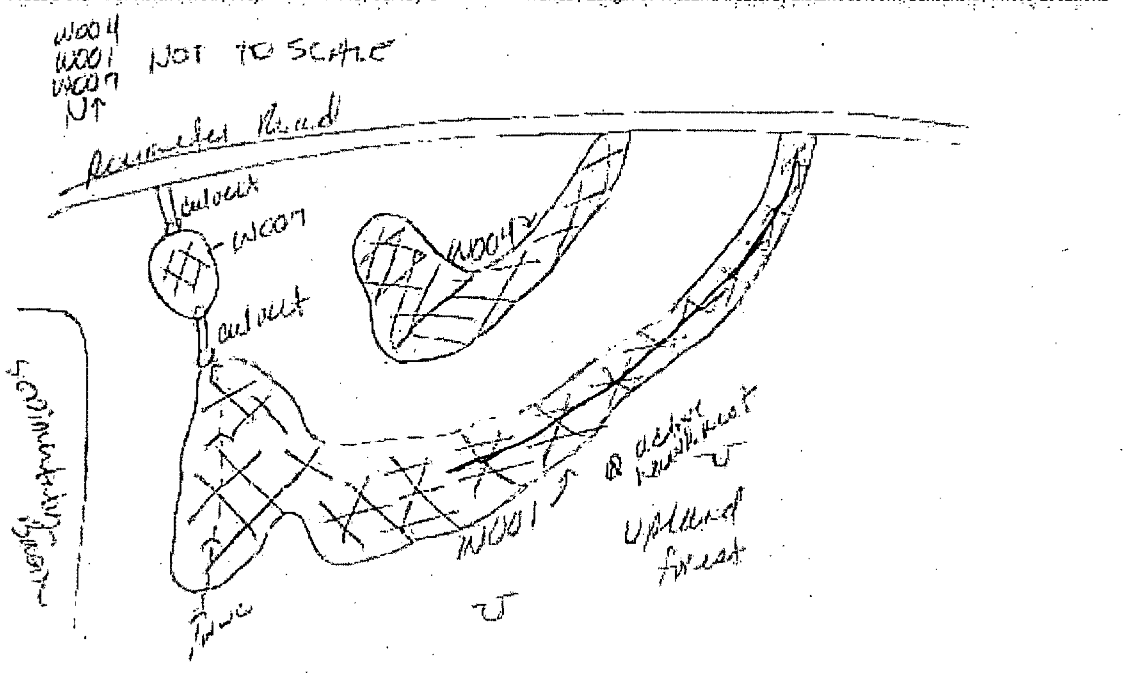
Estimated size: 0.02 acres

Wetland Descriptors

Sample ID: W007	Photo ID(s): 60-64
Flagging Description: 4 flags	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: culverted drainage to Towns Creek						
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking		Sheet Flow		Groundwater	3	Precipitation	Other
TVARAM SCORE:	34	TVARAM CATEGORY:	2								

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long etc)**

Crawfish burrows.

Culvert connects W007 to W001 and another culvert leaves W007 and goes beneath road towards Towns Creek.

Project: Bellefonte NP	Investigator: B. Dimick, K.Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W008
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: Sept. 1,2009	Problem Area:	n	Cowardin Code:	PSS1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Salix nigra*	Sapling	OBL	9.			
2.	*Juncus effusus*	Herb	FACW	10.			
3.	*Festuca arundinacea*	Herb	FAC	11.			
4.	*Eupatorium serotinum*	Herb	FAC	12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water: 0 (in.)
Depth to Free Water in Pit: ___ (in.)
Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators

___ Inundated
___ Saturated in Upper 12 in.
___ Sediment Deposits
___ Drift Lines
___ Water Marks
y Drainage Patterns

Secondary Indicators

___ Oxidized Root Channels
___ Water Stained Leaves

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 4/4	-	-	Silt loam
4-12+	10 YR 4/3			Silt Loam

Hydric Soil Indicators:

N	Gleyed or Low Chroma Colors	___ Histic Epipedon	___ Aquic Moisture Regime
	Sulfidic Odor	___ High Organic Cont. Surf. Layer Sandy Soils	___ Reducing Conditions
	Concretions	Organic Streaking in Sandy Soils	Other (Explain in Remarks)

Remarks: Hydric soils not present

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	N	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes	Y	No	
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

Estimated size: 0.43

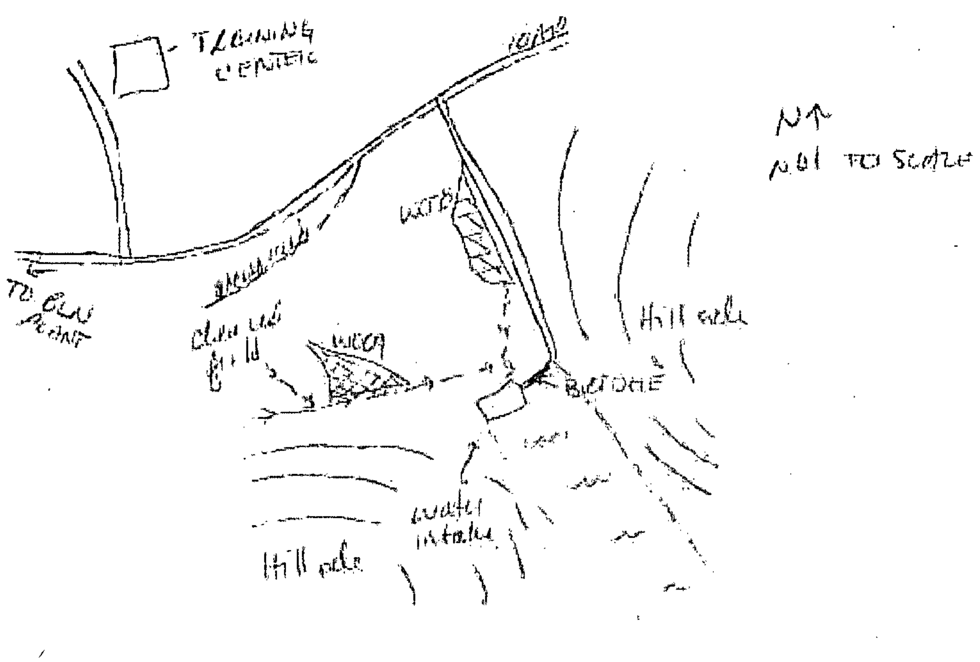
Wetland Descriptors

Sample ID: W008	Photo ID(s): 38,39

Flagging Description:

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Ephemeral conveyance to Guntersville Reservoir					
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking		Sheet Flow		Groundwater	3	Precipitation		Other

TVARAM SCORE:	31	TVARAM CATEGORY:	2

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential; existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)**

This wetland likely formed as a result of grading nearby that created a depression near a road.. This wetland does not meet the jurisdictional wetland criteria as defined by the US ACE. It meest USFWS wetland definition and should be considered for impacts under NEPA and Executive Order 11990.

Project: Bellefonte NP	Investigator: B. Dimick, K.Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W009
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: Sept. 1,2009	Problem Area:	n	Cowardin Code:	PSS1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Salix nigra*	Sapling	OBL	9.			
2.	*Juncus effusus*	Herb	FACW	10.			
3.	*Festuca arundinacea*	Herb	FAC	11.			
4.	*Cephalanthus occidentalis*	Shrub	OBL	12.			
5.	*Eupatorium serotinum*	Herb	FAC	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water: 0 (in.)
Depth to Free Water in Pit: ___ (in.)
Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators

___ Inundated
___ Saturated in Upper 12 in.
___ Sediment Deposits
___ Drift Lines
___ Water Marks
y Drainage Patterns

Secondary Indicators

___ Oxidized Root Channels
___ Water Stained Leaves

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 4/4	-	-	Silt loam
4-12+	10 YR 4/3			Silt Loam

Hydric Soil Indicators:

N	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Hydric soils not present

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	N	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes	Y	No	
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

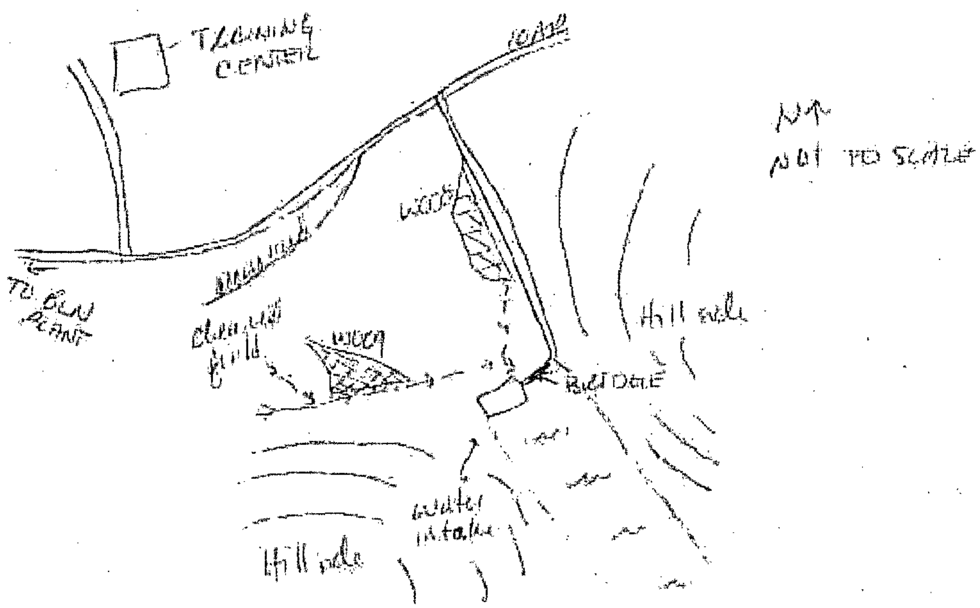
Estimated size: 0.61

Wetland Descriptors

Sample ID: W009	Photo ID(s): no photos
Flagging Description:	

Drawing

Please Include: North Arrow; Project Centerline; Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Ephemeral conveyance to Guntersville Reservoir								
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking		Sheet Flow		Groundwater	3	Precipitation		Other	

TVARAM SCORE:	31	TVARAM CATEGORY:	2

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)**

Does not have soils to meet jurisdictional wetland criteria as defined by the USACE. This wetland likely developed in a low spot left over after grading occurred. It meest USFWS wetland definition and should be considered for impacts under NEPA and Executive Order 11990.

Project: Bellefonte	Investigator: B. Dimick, K.Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W010
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: September 1, 2009	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr	Facw	9.	*Glyceria striata*	H	Obl
2.	*Liquidambar styraciflua*	Tr	Fac+	10.	*Polygonum sp.*	H	-
3.	*Quercus phellos*	Tr	Facw-	11.	*Salix nigra*	Tr	OBL
4.	*Ilex decidua*	Sh	Facw	12.	*Ligustrum sinense*	Sh	Fac
5.	*Berchemia scandens*	WV	Facw	13.	*Saururus cernuum*	Herb	OBL
6.	*Smilax glauca*	WV	Fac	14.	*Carpinus caroliniana*	Tr, Sh	Fac
7.	*Populus deltoides*	Tr	Fac	15.	*Campsis radicans*	Sap	Fac
8.	*Celtis laevigata*	Tr	Facw	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100

Hydrology

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 0 (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
	Inundated		Drift Lines	Y	Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 3/1	-	-	Silty clay loam
4-12+	10 YR 5/2	10 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

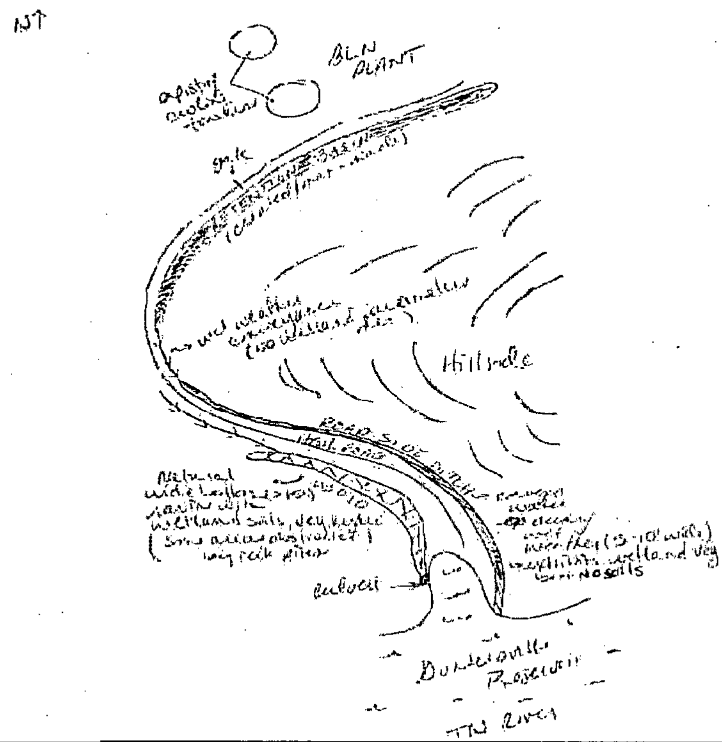
Estimated size: 0.96 acres

Wetland Descriptors

Sample ID: W010	**Photo ID(s):** 16-18,24,26,153-165
Flagging Description:	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Drains directly into Guntersville Resevoir via a culvert						
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking		Sheet Flow	2	Groundwater	3	Precipitation	Other
TVARAM SCORE:	50	**TVARAM CATEGORY:**	2								

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc.)

This drainage feature is a wide bottom, natural ravine with large wetland trees and wetland soils (although some places are rocky). The majority of the ravine contains at least minimal vegetation. The ravine empties into Guntersville Resevoir via a culvert near the shoreline.

TVARAM Field Form Quantitative Rating

Site: Bellefonte W001	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

Metric 1. Wetland Area (size)

3 (max 6 pts.) | 3 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [3] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

7 (max 14 pts.) | 10 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [4] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [5] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

21 (max 30 pts.) | 31 (subtotal)

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [2] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [x] tile (including culvert)
- [x] dike
- [ ] weir
- [x] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ____________

Metric 4. Habitat Alteration and Development

13.5 (max 20 pts.) | 44.5 (subtotal)

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [3] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [5] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

44.5
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W001	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

44.5 — subtotal previous page

10 (max 10 pts) | **54.5** (subtotal)

Metric 5. Special Wetlands

10 (raw score*)

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq m, sphagnum or other moss (5); muck, organic soil layer (3)
- [x] Assoc. forest (wet) &/or adj. upland] incl. >0.25 acre (0.1 ha), old growth (10), mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [x] **Vernal pool** (5); isolated, perched, or depression wetland (4), headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, tilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] (excludes records which are only "historic")
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5), in reservoir buttonbush (4), other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

9 (max 20 pts) | **63.5** (subtotal)

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [x] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ____________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [x] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (3)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [x] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale

- [ ] Vegetated hummocks/tussocks
- [x] Coarse woody debris >15 cm (6 in.)
- [x] Standing dead >25 cm (10 in.) dbh
- [x] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

None Low Low Moderate Moderate High

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

63.5 Category 3 | **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2006-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W002	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

3	3
max 6 pts.	subtotal

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [3] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

11	14
max 14 pts.	subtotal

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [7] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

23	37
max 30 pts.	subtotal

Metric 3. Hydrology

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [x] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other ______________

14	51
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [3] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [4] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [9] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [x] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

51
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W002	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

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Metric 5. Special Wetlands

10 max 10 pts | **61** subtotal

20 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- Bog, fen, wet prairie (10), acidophilic veg., **mossy substrate** >10 sq m, sphagnum **or other moss** (5); muck, organic soil layer (3)
- Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10), **mature >18 in. (45 cm) dbh (5)** (exclude pine plantation)
- Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- **Vernal pool (5)**; isolated, perched, or slope wetland (4); headwater wetland (1st order perennial or above) (3)
- Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- Grass marsh, swamp in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- Superior/enhanced habitat/use: migratory songbird/waterfowl (5), in-reservoir buttonbush (4), other fish/wildlife management/designation (3)
- Cat. 1 (very low quality), <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

8 max 20 pts | **69** subtotal

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- Aquatic bed
- Emergent
- Shrub
- 3 Forest
- Mudflats
- Open water <20 acres (8 ha)
- Moss/lichen Other ____

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous area [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- High (5)
- Moderately high (4) [BR/CM (5)]
- 3 Moderate (3) [BR/CM (5)]
- Moderately low (2) [BR/CM (3)]
- Low (1) [BR/CM (2)]
- None (0)

Narrative Description of Vegetation Quality

Low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage

- Extensive >75% cover (-5)
- Moderate 25-75% cover (-3)
- -1 Sparse 5-25% cover (-1)
- Nearly absent <5% cover (0)
- Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acre) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale

- Vegetated hummocks/tussocks
- 1 Coarse woody debris >15 cm (6 in.)
- 1 Standing dead >25 cm (10 in.) dbh
- 3 Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

69 Category 3 | **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2006-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W003	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

2	2
max 6 pts.	subtotal

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

4	6
max 14 pts.	subtotal

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [5] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

14	20
max 30 pts.	subtotal

Metric 3. Hydrology

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [ ] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [ ] Seasonally inundated (2) [BR/CM (4)]
- [1] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [3] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other ______

9	29
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [3] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [3] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [3] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

29
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W003	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

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4	33
max 10 pts	subtotal

4 raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 Wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m), sphagnum or other moss (5), muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Significant geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [x] Vernal pool (5); **Isolated, perched, or slope wetland (4)**; headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. attrib. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, tilted, shallow roots(tip-up), or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

2	35
max 20 pts	subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [x] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ____________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [x] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often, but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [x] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

35 Category 2 **GRAND TOTAL (max 100 pts)**

*Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W004	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

Metric 1. Wetland Area (size)

2	2
max 6 pts.	subtotal

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- ☐ >50 acres (>20.2 ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- ☐ 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- ☐ 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- ☐ 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- ☐ <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

5	8
max 14 pts.	subtotal

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- ☐ WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- ☐ MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [5] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [3] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- ☐ High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

15	23
max 30 pts.	subtotal

3a. Sources of water: Score all that apply.
- ☐ High pH groundwater (5)
- ☐ Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- ☐ 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- ☐ >0.7 m (27.6 in.) (3)
- ☐ 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [2] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- ☐ Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- ☐ None or none apparent (12)
- [7] Recovered (7)
- [3] Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed
- ☐ ditch
- ☒ tile (including culvert)
- ☒ dike
- ☐ weir
- ☒ stormwater input
- ☐ point source (nonstormwater)
- ☒ filling/grading
- ☐ road bed/RR track
- ☐ dredging
- ☐ other ____________

Metric 4. Habitat Alteration and Development

11	34
max 20 pts.	subtotal

4a. Substrate disturbance. Score one or double check and average.
- ☐ None or none apparent (4)
- [3] Recovered (3)
- [2] Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- [4] Moderately good (4)
- ☐ Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.
- ☐ None or none apparent (9)
- [6] Recovered (6)
- [3] Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed
- ☐ mowing
- ☐ grazing
- ☐ clearcutting
- ☐ selective cutting
- ☐ farming
- ☐ toxic pollutants
- ☐ shrub/sapling removal
- ☐ herbaceous/aquatic bed removal
- ☐ woody debris removal
- ☐ sedimentation
- ☐ dredging
- ☐ nutrient enrichment

34
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W004	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

34 subtotal previous page

8 max 10 pts | **42** subtotal | **8** raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selected (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [illegible] Bog, fen, wet prairie (10); acidophilic veg., mossy **substrate >10 sq.m.**, sphagnum or **other moss (5)**; muck, organic soil layer (3)
- ☐ Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha), old growth (10), **mature >18 in. (45 cm) dbh (5)** (exclude pine plantation)
- ☐ Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- ☐ **Vernal pool (5)**; isolated, perched, or depressional wetland (4); headwater wetland [1st order perennial or above] (3)
- ☐ Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- ☐ Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [illegible] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow root/tip-up, or pneumatophores (3)
- ☐ Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- ☐ Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3)
  [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- ☐ Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other list/wildlife management/designation (3)
- ☐ Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR unvegetated on mined/excavated land (-10)

13 max 20 pts | **55** subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- ☐ Aquatic bed
- ☐ Emergent
- [illegible] Shrub
- [illegible] Forest
- ☐ Mudflats
- [illegible] Open water <20 acres (8 ha)
- ☐ Moss/lichen Other ____________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous area [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- ☐ High (5)
- ☐ Moderately high (4) [BR/CM (5)]
- [illegible] Moderate (3) [BR/CM (5)]
- ☐ Moderately low (2) [BR/CM (3)]
- ☐ Low (1) [BR/CM (2)]
- ☐ None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- -1 Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale.

- ☐ Vegetated hummocks/tussocks
- [illegible] Coarse woody debris >15 cm (6 in.)
- 1 Standing dead >25 cm (10 in.) dbh
- [illegible] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

55 Category 2 | **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2006-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W005	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

2	2
max 6 pts.	subtotal

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

13	15
max 14 pts.	subtotal

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [7] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [5] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [ ] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

19	34
max 30 pts.	subtotal

Metric 3. Hydrology

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [ ] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [12] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ________

14	48
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.

- [4] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [4] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [x] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

48
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W005	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

48 subtotal previous page

4 max 10 pts | **52** subtotal

4 raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selected (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [ ] Bog, fen, wet prairie (10), acidophilic veg., **mossy substrate** > 10 sq m, sphagnum or **other moss** (5), muck, organic soil layer (3)
- [ ] Assoc. forest (wet &/or adj. upland) incl. >0.25 acre (0.1 ha), old growth (10), mature > 18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [3] **Vernal pool** (5), isolated, perched, or slope wetland (4), headwater wetland (1st order perennial or above) (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/riverine depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow root/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5), in-reservoir buttonbush (4), other list/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

8 max 20 pts | **60** subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [1] Forest
- [ ] Mudflats
- [1] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [3] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

Low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often, but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale

- [ ] Vegetated hummock/tussocks
- [1] Coarse woody debris >15 cm (6 in.)
- [1] Standing dead >25 cm (10 in.) dbh
- [1] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

60 Category 3 | **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2006-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W006	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

2	2
max 6 pts.	subtotal

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

9	11
max 14 pts.	subtotal

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [4] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [3] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [ ] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

20	31
max 30 pts.	subtotal

Metric 3. Hydrology

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [x] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other ________

12.5	43.5
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [3] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [5] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [6] Recovered (6)
- [3] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

43.5
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W006	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

43.5
subtotal prev ous page

8 (max 10 pts) **51.5** (subtotal)

8 (raw score*)

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [5] Bog, fen, wet prairie (10), acidophilic veg., **mossy substrate > 10 sq.m, sphagnum or other moss** (5), muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha), old growth (10), mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); **isolated, perched, or slope wetland** (4), headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [3] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, tussock, shallow root/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3)
  [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in reservoir buttonbush (4); other list/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

12 (max 20 pts) **63.5** (subtotal)

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- [ ] Aquatic bed
- [1] Emergent
- [ ] Shrub
- [3] Forest
- [ ] Mudflats
- [1] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ______

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous area [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [3] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.7 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale

- [1] Vegetated hummocks/tussocks
- [3] Coarse woody debris >15 cm (6 in.)
- [1] Standing dead >25 cm (10 in.) dbh
- [illegible] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

None Low Low Moderate Moderate High

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

63.5 Category 3 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2006-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W007	Rater(s): Britta Dimick	Date: 9/1/09

1	1
max 6 pts.	subtotal

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [1] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

4	5
max 14 pts.	subtotal

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

17	22
max 30 pts.	subtotal

Metric 3. Hydrology

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [x] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ______________

9	31
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [1] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

31
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W007	Rater(s): Britta Dimick	Date: 9/01/09

31 subtotal previous page

0 max 10 pts. **31** subtotal

0 raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- ☐ Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5), muck, organic soil layer (3)
- ☐ Assoc. forest (wet &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- ☐ Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- ☐ Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- ☐ Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- ☐ Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- ☐ Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- ☐ Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- ☐ Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- ☐ Superior/enhanced habitat/use: migratory songbird/waterfowl (5), in reservoir buttonbush (4), other list/wildlife management/designation (3)
- ☐ Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

3 max 20 pts. **34** subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- ☐ Aquatic bed
- 1 Emergent
- 1 Shrub
- 1 Forest
- ☐ Mudflats
- ☐ Open water <20 acres (8 ha)
- ☐ Moss/lichen. Other ______

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous area [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- ☐ High (5)
- ☐ Moderately high (4) [BR/CM (5)]
- ☐ Moderate (3) [BR/CM (5)]
- ☐ Moderately low (2) [BR/CM (3)]
- 1 Low (1) [BR/CM (2)]
- ☐ None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often, but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage.

- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- 1 Sparse 5-25% cover (+1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

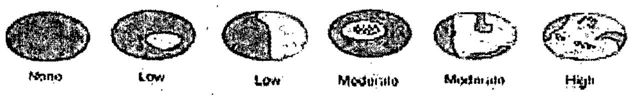
Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- ☐ Vegetated hummocks/tussocks
- ☐ Coarse woody debris >15 cm (6 in.)
- ☐ Standing dead >25 cm (10 in.) dbh
- ☐ Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion



Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

34=Category 2 **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2, moderate quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2006-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W008	Rater(s): Britta Dimick	Date: 9/1/09

2 | 2 Metric 1. Wetland Area (size)

max 6 pts. subtotal

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

2 | 2 Metric 2. Upland Buffers and Surrounding Land Use

max 14 pts. subtotal

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

17 | 19 Metric 3. Hydrology

max 30 pts. subtotal

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other ________

11 | 30 Metric 4. Habitat Alteration and Development

max 20 pts. subtotal

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [3] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

30

subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W008	Rater(s): Britta Dimick	Date: 9/01/09

30
subtotal previous page

0	30
max 10 pts	subtotal

0
raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selected (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [ ] Bog, fen, wet prairie (10), acidophilic veg., mossy substrate >10 sq m, sphagnum or other moss (5), muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha), old growth (10), mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4), headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Grass marsh, atlant. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, tilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3)
  [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5), in-reservoir buttonbush (4), other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

1	31
max 20 pts	subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- [ ] Aquatic bed
- [1] Emergent
- [1] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ____________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [1] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species.
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [-3] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale.

- [1] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

None | Low | Low | Moderate | Moderate | High

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

31=Category 2 **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2; moderage quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W009	Rater(s): Britta Dimick	Date: 9/1/09

2 (max 6 pts.) | 2 (subtotal)

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

2 (max 14 pts.) | 2 (subtotal)

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

17 (max 30 pts.) | 19 (subtotal)

Metric 3. Hydrology

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [x] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ________

11 (max 20 pts.) | 30 (subtotal)

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [3] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

30 (subtotal this page)

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W009	Rater(s): Britta Dimick	Date: 9/01/09

30
subtotal previous page

0	30
max 10 pts	subtotal

0
raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [ ] Bog, fen, wet prairie (10), acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5), muck, organic soil layer (3)
- [ ] Assoc. forest (wet &/or adj. upland) incl. >0.25 acre (0.1 ha), old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4), headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depression (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Growth form adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] (exclude records which are only "historic")
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4), other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

1	31
max 20 pts	subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale

- [ ] Aquatic bed
- [x] 1 Emergent
- [x] 1 Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [x] 1 Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [x] 3 Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acres)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale

- [x] 1 Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

31=Category 2 | **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality, 30-59 = Category 2, moderage quality, 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W010	Rater(s): Britta Dimick	Date: 9/1/09

2	2
max 6 pts.	subtotal

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

7	9
max 14 pts.	subtotal

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [4] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [5] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

17	26
max 30 pts.	subtotal

Metric 3. Hydrology

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [x] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [x] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other ____________

18	44
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [4] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [12] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [x] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

44
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W0010	Rater(s): Britta Dimick	Date: 9/01/09

44 — subtotal previous page

0 max 10 pts | **44** subtotal | **0** raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selected (photos, checklists, maps, resource specialist concurrence, data sources, references, etc)

- [ ] Bog, fen, wet prairie (10), acidophilic veg., mossy substrate >10 sq m, sphagnum or other moss (5), muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha), old growth (10), mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4), headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/riverine depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Old growth attrib. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, sliced, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10), other rare species with global rank: G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5), in reservoir buttonbush (4), other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR unvegetated on mined/excavated land (-10)

6 max 20 pts | **50** subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities
Score all present using 0 to 3 scale
- [ ] Aquatic bed
- [1] Emergent
- [illegible] Shrub
- [illegible] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen Other ________

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous area [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion
Select only one
- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [1] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants
Add or deduct points for coverage,
- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography
Score all present using 0 to 3 scale.
- [1] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

50=Category 2 | **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2, moderage quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

APPENDIX G – RESERVOIR FISH ASSEMBLAGE INDEX (RFAI), RESERVOIR BENTHIC INDEX (RBI) SCORES, AND HISTORICAL FISH SPECIES OCCURRENCES

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Table G-1. Individual Metric Scores and the Overall RFAI Scores Downstream (TRM 390.0) and Upstream (TRM 393.0) of Bellefonte Nuclear Plant, Spring 2009

Spring 2009 Metric	Gear Type	TRM 390.0 Observed	Score	TRM 393.0 Observed	Score
A. Species richness and composition 1. Number of species		**21 Species**	3	**26 Species**	3
2. Number of centrarchid species (less micropterus)		**6 Species** Black Crappie Bluegill Green Sunfish Redbreast Sunfish Redear Sunfish Warmouth	5	**6 Species** Black Crappie Bluegill Longear Sunfish Redbreast Sunfish Redear Sunfish Warmouth	5
3. Number of benthic invertivore species		**2 Species** Freshwater drum Logperch	1	**1 Species** Freshwater drum	1
4. Number of intolerant species		**0 Species**	1	**2 Species** Skipjack Herring Longear Sunfish	1
5. Percent tolerant individuals	Electrofishing	**72.7%** Bluegill 51.5% Largemouth Bass 13.3% Spotfin Shiner 2.2% Gizzard Shad 2.0% Redbreast Sunfish 2.0% Bluntnose Minnow 1.1% Common Carp 0.4% Green Sunfish 0.2%	**0.5**	**73.6 %** Bluegill 54.5% Largemouth Bass 8.9% Gizzard Shad 3.4% Common Carp 3.2% Spotfin Shiner 2.8% Redbreast Sunfish 0.3% Western Mosquitofish 0.3% Bluntnose Minnow 0.1% Yellow Bullhead 0.1%	**0.5**
	Gill Netting	**41.0%** Longnose Gar 19.4% Common Carp 11.2% Largemouth Bass 5.2% Bluegill 4.5% Gizzard Shad 0.7%	**0.5**	**17.2%** Gizzard Shad 7.0% Longnose Gar 5.7% Common Carp 1.9% Largemouth Bass 1.4% Bluegill 0.6% Brown Bullhead 0.6%	**1.5**
6. Percent dominance by one species	Electrofishing	**51.5%** Bluegill	**1.5**	**54.5%** Bluegill	**1.5**
	Gill Netting	**22.4%** Yellow Bass	**1.5**	**49.0%** Yellow Bass	**0.5**
7. Percent nonnative species	Electrofishing	**12.4%** Inland Silverside 11.6% Common Carp 0.4% Yellow Perch 0.4%	**0.5**	**3.5%** Common Carp 3.2% Yellow Perch 0.3%	**0.5**
	Gill Netting	**11.2%** Common Carp 11.2%	**0.5**	**2.5%** Common Carp 1.9% Grass Carp 0.6%	**0.5**

Table G-1 (Continued)

Spring 2009 Metric	Gear Type	TRM 390.0 Observed	TRM 390.0 Score	TRM 393.0 Observed	TRM 393.0 Score
8. Number of top carnivore species		**8 Species** Black Crappie *Flathead Catfish* Largemouth Bass Longnose Gar Spotted Bass Spotted Gar White Bass Yellow Bass	5	**9 Species** Black Crappie *Flathead Catfish* Largemouth Bass Longnose Gar Skipjack Herring Spotted Bass Spotted Gar White Bass Yellow Bass	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	**15.7%** Largemouth Bass 13.2% Yellow Bass 1.5% Spotted Gar 0.6% Spotted Bass 0.4%	2.5	**11.7%** Largemouth Bass 8.9% Spotted Bass 1.4% Yellow Bass 1.0% White Bass 0.3% Black Crappie 0.1%	2.5
	Gill Netting	**64.2%** Yellow Bass 22.5% Longnose Gar 19.3% White Bass 6.1% Largemouth Bass 5.2% Spotted Bass 4.5% Black Crappie 3.6% Flathead Catfish 3.0%	2.5	**73.9%** Yellow Bass 49.0% Spotted Bass 8.4% Longnose Gar 5.7% White Bass 4.5% Flathead Catfish 2.5% Black Crappie 1.3% Largemouth Bass 1.3% Skipjack Herring 0.6% Spotted Gar 0.6%	2.5
10. Percent omnivores	Electrofishing	**9.0%** Channel Catfish 5.5% Gizzard Shad 2.0% Bluntnose Minnow 1.1% Common Carp 0.4%	2.5	**12.3%** Channel Catfish 5.4% Gizzard Shad 3.3% Common Carp 3.2% Bluntnose Minnow 0.1% Yellow Bullhead 0.1%	2.5
	Gill Netting	**23.9%** Common Carp 11.2% Blue Catfish 7.5% Channel Catfish 4.5% Gizzard Shad 0.7%	1.5	**20.4%** Blue Catfish 7.6% Gizzard Shad 7.0% Channel Catfish 3.2% Common Carp 1.9% Brown Bullhead 0.6%	1.5
C. ***Fish abundance and health***					
11. Average number per run	Electrofishing	**36.1**	**0.5**	**47.8**	**0.5**
	Gill Netting	**13.4**	**1.5**	**15.7**	**1.5**
12. Percent anomalies	Electrofishing	**4.1%**	**1.5**	**8.1%**	**0.5**
	Gill Netting	**0.0%**	**2.5**	**1.3%**	**2.5**
Overall RFAI Score			**35** **Fair**		**34** **Fair**

Table G-2. Individual Metric Scores and the Overall RFAI Scores Downstream (TRM 390.0) and Upstream (TRM 393.0) of Bellefonte Nuclear Plant, Summer 2009

Summer 2009 Metric	Gear Type	TRM 390.0 Observed	TRM 390.0 Score	TRM 393.0 Observed	TRM 393.0 Score
A. Species richness and composition					
1. Number of species		**20 Species**	**3**	**23 Species**	**3**
2. Number of centrarchid species (less micropterus)		**7 Species** Black Crappie Bluegill Longear Sunfish Redbreast Sunfish Redear Sunfish Warmouth White Crappie	**5**	**7 Species** Black Crappie Bluegill Green Sunfish Longear Sunfish Redbreast Sunfish Redear Sunfish Warmouth	**5**
3. Number of benthic invertivore species		**1 Species** Freshwater drum	**1**	**1 Species** Freshwater drum	**1**
4. Number of intolerant species		**1 Species** Longear Sunfish	**1**	**2 Species** Skipjack Herring Longear Sunfish	**1**
5. Percent tolerant individuals	Electrofishing	**59.7%** Largemouth Bass 20.6% Bluegill 14.7% Western mosquitofish 10.0% Gizzard Shad 5.7% Spotfin Shiner 4.1% Golden Shiner 2.3% Common Carp 1.4% Redbreast Sunfish 0.6% White Crappie 0.3%	**0.5**	**63.3 %** Bluegill 22.2% Largemouth Bass 11.8% Gizzard Shad 11.7% Spotfin Shiner 8.9% Golden Shiner 7.4% Longnose Gar 0.7% Yellow bullhead 0.2% Redbreast Sunfish 0.2% Green Sunfish 0.2%	**0.5**
	Gill Netting	**41.0%** Longnose gar 14.0% Common Carp 13.0% Gizzard Shad 9.0% Largemouth Bass 3.0% Bluegill 2.0%	**0.5**	**38.4%** Longnose Gar 17.4% Gizzard Shad 10.5% Largemouth Bass 8.1% Common Carp 2.3%	**0.5**
6. Percent dominance by one species	Electrofishing	**20.5%** Largemouth Bass	**2.5**	**25.4%** Spotted Gar	**2.5**
	Gill Netting	**17.0%** Channel Catfish	**1.5**	**26.7%** Channel Catfish	**1.5**
7. Percent nonnative species	Electrofishing	**3.1%** Inland Silverside 1.7% Common Carp 1.4%	**0.5**	**2.0%** Inland Silverside 2.0%	**1.5**
	Gill Netting	**13.0%** Common Carp 13.0%	**0.5**	**3.5%** Common Carp 2.3% Yellow Perch 1.2%	**0.5**

Table G-2 (Continued)

Summer 2009 Metric	Gear Type	TRM 390.0 Observed	TRM 390.0 Score	TRM 393.0 Observed	TRM 393.0 Score
8. Number of top carnivore species		**7 Species** Black Crappie Flathead Catfish Largemouth Bass Longnose Gar Spotted Bass Spotted Gar White Crappie	3	**8 Species** Black Crappie Flathead Catfish Largemouth Bass Longnose Gar Spotted bass Skipjack Herring Spotted Gar Yellow Bass	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	**42.0%** Largemouth Bass 20.9% Spotted Gar 19.5% Black Crappie 0.8% Flathead Catfish 0.4% White Crappie 0.4%	2.5	**38.5%** Spotted Gar 25.4% Largemouth Bass 11.8% Longnose Gar 0.7% Black Crappie 0.4% Flathead Catfish 0.2%	2.5
	Gill Netting	**45.0%** Flathead Catfish 15.0% Longnose Gar 14.0% Spotted Bass 7.0% Spotted Gar 4.0% Largemouth Bass 3.0% Black Crappie 2.0%	2.5	**48.8%** Longnose Gar 17.4% Flathead Catfish 10.4% Spotted Bass 9.3% Largemouth Bass 8.1% Black Crappie 1.2% Skipjack Herring 1.2% Yellow Bass 1.2%	2.5
10. Percent omnivores	Electrofishing	**12.6%** Gizzard Shad 5.8% Channel Catfish 3.1% Golden Shiner 2.3% Common Carp 1.4%	2.5	**20.5%** Gizzard Shad 11.6% Golden Shiner 7.4% Channel Catfish 1.3% Yellow Bullhead 0.2%	2.5
	Gill Netting	**41.0%** Channel Catfish 17.0% Common Carp 13.0% Gizzard Shad 9.0% Blue Catfish 2.0%	0.5	**41.9%** Channel Catfish 26.7% Gizzard Shad 10.6% Blue Catfish 2.3% Common Carp 2.3%	0.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	19.5	0.5	29.9	0.5
	Gill Netting	10.0	0.5	8.6	0.5
12. Percent anomalies	Electrofishing	2.4%	1.5	1.3%	2.5
	Gill Netting	6.0%	0.5	3.5%	1.5
Overall RFAI Score			30 Poor		35 Fair

Table G-3. Individual Metric Scores and the Overall RFAI Scores Downstream (TRM 390.0) and Upstream (TRM 393.0) of Bellefonte Nuclear Plant, Autumn 2009

Autumn 2009 Metric	Gear Type	TRM 390.0 Observed	TRM 390.0 Score	TRM 393.0 Observed	TRM 393.0 Score
A. Species richness and composition 1. Number of species		**26 Species**	**3**	**30 Species**	**3**
2. Number of centrarchid species (less micropterus)		**7 Species** Black crappie Bluegill *Green sunfish* Longear sunfish Redbreast sunfish Redear sunfish Warmouth	**5**	**5 Species** Black crappie Bluegill *Longear sunfish* Redear sunfish Warmouth	**5**
3. Number of benthic invertivore species		**1 Species** Freshwater drum	**1**	**2 Species** Freshwater drum Spotted sucker	**1**
4. Number of intolerant species		**2 Species** Brook silverside Longear sunfish	**1**	**5 Species** Brook silverside Longear sunfish Skipjack herring Smallmouth bass Spotted sucker	**5**
5. Percent tolerant individuals	Electrofishing	**67.8%** Bluegill 31.26% Bluntnose minnow 1.93% Common carp 1.59% Gizzard shad 18.36% Golden shiner 0.55% Green sunfish 0.07% Largemouth bass 12.70% *Redbreast sunfish* 0.48% Spotfin shiner 0.90%	**0.5**	**74%** Bluegill 36.53% Bluntnose minnow 0.45% Common carp 0.98% Gizzard shad 14.11% Golden shiner 6.04% Largemouth bass 9.06% Spotfin shiner 6.64% *W. mosquitofish* 0.15%	**0.5**
	Gill Netting	**5.7%** Common carp 2.86% Largemouth bass 2.86%	**2.5**	**26%** Common carp 0.81% Gizzard shad 17.89% Golden shiner 1.63% Largemouth bass 5.69%	**1.5**
6. Percent dominance by one species	Electrofishing	**31.3%** Bluegill	**1.5**	**36.5%** Bluegill	**1.5**
	Gill Netting	**22.9%** Blue catfish	**1.5**	**17.9%** Gizzard shad	**1.5**

Table G-3 (Continued)

Autumn 2009 Metric	Gear Type	TRM 390.0 Observed	Score	TRM 393.0 Observed	Score
C. **Fish abundance and health**					
11. Average number per run	Electrofishing	**96.6**	**0.5**	**88.3**	**0.5**
	Gill Netting	**3.5**	**0.5**	**12.3**	**1.5**
12. Percent anomalies	Electrofishing	**3.6%**	**1.5**	**4.7%**	**1.5**
	Gill Netting	**0.0%**	**2.5**	**0.0%**	**2.5**
Overall RFAI Score			**34** **Fair**		**40** **Fair**

Table G-4. Comparison of RFAI Scores From Autumn Sampling Conducted During 1993-2009 as Part of the Vital Signs (VS) Monitoring Program* in Guntersville Reservoir. Sites at Tennessee River Mile (TRM) 410 and 405 are upstream and downstream monitoring sites for Widows Creek Fossil Plant and are not part of the VS monitoring Program.

Location	Site	1993	1994	1996	1998	2000	2001	2002	2004	2005	2006	2007	2008	2009	Average
Inflow	TRM 424*	36	46	42	34	28	---	46	42	---	38	---	34	44	39
Inflow	TRM 410	---	---	---	---	34	32	34	---	32	38	30	28	34	33
Inflow	TRM 405	---	---	---	---	38	40	32	---	36	34	32	24	34	34
Transition	TRM 375.2*	42	35	38	32	41	---	34	33	---	36	---	37	40	37
Forebay	TRM 350*	45	38	48	41	42	---	36	41	---	44	---	35	38	41

Downstream of BLN

Location	Site	Spring 2009	Summer 2009	Autumn 2009	**Average**
Transition	TRM 390	35	30	34	33

Upstream of BLN

Location	Site	Spring 2009	Summer 2009	Autumn 2009	**Average**
Transition	TRM 393	34	35	40	36

Note: Spring, summer, and autumn 2009 RFAI scores from sites located upstream and downstream of BLN are also included for comparison.

RFAI Scores: 12-21 (Very Poor); 22-31 (Poor); 32-40 (Fair); 41-50 (Good); or 51-60 (Excellent)

Table G-5. A Comparison of Overall Species Occurrences From Current and Historical Data From TVA Fish Samples in Guntersville Reservoir During Electro-fishing, Gill Netting, Hoop Netting, and Cove Rotenone Surveys, As Well As Data From Fish Impingement Studies Conducted at Widows Creek Fossil Plant (WCF)

	Common Name	Scientific Name	RFAI 1993-2009	Historic EF/GN/HN 1974-1984	Cove Rotenone 1949-1993	WCF Impingement 1974-1975	WCF Impingement 2005-2007	2009 Qualitative Species Sampling
1	American eel	*Anguilla rostrata*	---	X	---	---	---	---
2	Atlantic needlefish	*Strongylura marina*	X	---	---	---	---	---
3	Bigeye chub	*Hybopsis amblops*	---	---	X	---	---	---
4	Bigmouth buffalo	*Ictiobus cyprinellus*	X	X	X	---	---	---
5	Black buffalo	*Ictiobus niger*	X	X	X	---	X	X
6	Black bullhead	*Ameiurus melas*	X	---	X	X	---	---
7	Black crappie	*Pomoxis nigromaculatus*	X	X	X	---	X	X
8	Black redhorse	*Moxostoma duquesnei*	X	---	X	---	X	X
9	Blackspotted topminnow	*Fundulus olivaceus*	X	---	X	---	---	X
10	Blackstripe topminnow	*Fundulus notatus*	X	---	X	---	---	X
11	Blacktail shiner*	*Cyprinella venusta*	---	---	X	---	---	---
12	Blue catfish	*Ictalurus furcatus*	X	X	X	---	X	---
13	Bluegill	*Lepomis macrochirus*	X	X	X	X	X	X
14	Bluntnose darter*	*Etheostoma chlorosomum*	---	---	X	---	---	---
15	Bluntnose minnow	*Pimephales notatus*	X	---	---	---	---	X
16	Bowfin	*Amia calva*	X	X	X	---	---	X
17	Brook silverside	*Labidesthes sicculus*	X	X	X	---	---	X
18	Brown bullhead	*Ameiurus nebulosus*	X	X	X	---	---	X
19	Bullhead minnow	*Pimephales vigilax*	X	---	X	---	---	X
20	Channel catfish	*Ictalurus punctatus*	X	X	X	X	X	X
21	Channel shiner	*Notropis wickliffi*	X	---	---	---	---	---
22	Chestnut lamprey	*Ichthyomyzon castaneus*	X	---	X	X	---	---
23	Common carp	*Cyprinus carpio*	X	X	X	X	---	X
24	Creek chub	*Semotilus atromaculatus*	---	---	X	---	---	---
25	Dusky darter	*Percina sciera*	X	---	---	---	X	---
26	Emerald shiner	*Notropis atherinoides*	X	X	X	X	X	---
27	Fantail darter*	*Etheostoma flabellare*	---	---	X	---	---	---
28	Fathead minnow	*Pimephales promelas*	X	---	X	---	---	---
29	Flathead catfish	*Pylodictis olivaris*	X	X	X	---	X	X
30	Freshwater drum	*Aplodinotus grunniens*	X	X	X	X	X	X

Table G-5. (Continued)

	Common Name	Scientific Name	RFAI 1993-2009	Historic EF/GN/HN 1974-1984	Cove Rotenone 1949-1993	WCF Impingement 1974-1975	WCF Impingement 2005-2007	2009 Qualitative Species Sampling
31	Ghost shiner	*Notropis buchanani*	---	---	X	---	---	---
32	Gizzard shad	*Dorosoma cepedianum*	X	X	X	X	X	X
33	Golden redhorse	*Moxostoma erythrurum*	X	X	X	---	---	X
34	Golden shiner	*Notemigonus crysoleucas*	X	X	X	---	X	X
35	Goldfish	*Carassius auratus*	X	---	X	---	---	---
36	Grass carp	*Ctenopharyngodon idella*	X	---	X	---	---	X
37	Green sunfish	*Lepomis cyanellus*	X	X	X	X	X	X
38	Highfin carpsucker	*Carpiodes velifer*	---	---	X	---	---	---
39	Inland silverside	*Menidia beryllina*	X	---	---	---	X	---
40	Largemouth bass	*Micropterus salmoides*	X	X	X	X	X	X
41	Largescale stoneroller	*Campostoma oligolepis*	X	---	X	---	---	X
42	Logperch	*Percina caprodes*	X	X	X	X	X	X
43	Longear sunfish	*Lepomis megalotis*	X	X	X	X	X	X
44	Longnose gar	*Lepisosteus osseus*	X	X	X	---	X	X
45	Mimic shiner	*Notropis volucellus*	X	---	X	---	X	---
46	Mooneye	*Hiodon tergisus*	X	X	X	X	---	---
47	Northern hogsucker	*Hypentelium nigricans*	X	---	X	---	---	X
48	Orangespotted sunfish	*Lepomis humilis*	---	---	X	X	X	---
49	Pugnose minnow	*Opsopoeodus emiliae*	---	---	X	---	---	---
50	Paddlefish	*Polyodon spathula*	---	X	---	X	---	---
51	Quillback	*Carpiodes cyprinus*	---	---	X	---	---	---
52	Rainbow darter	*Etheostoma caeruleum*	---	---	---	---	---	X
53	Redbreast sunfish	*Lepomis auritus*	X	---	X	---	X	X
54	Redear sunfish	*Lepomis microlophus*	X	---	X	X	X	X
55	Redline darter*	*Etheostoma rufilineatum*	---	---	X	---	---	---
56	River carpsucker	*Carpiodes carpio*	---	X	X	---	---	---
57	River darter	*Percina shumardi*	---	---	---	---	X	---
58	River redhorse	*Moxostoma carinatum*	X	---	---	---	---	---
59	Rock bass	*Ambloplites rupestris*	X	---	X	X	X	---
60	Sauger	*Sander canadensis*	X	---	X	X	X	---
61	Shortnose gar*	*Lepisosteus platostomus*	---	---	X	---	---	---
62	Silver chub	*Macrhybopsis storeriana*	---	X	X	---	---	---
63	Silver Redhorse	*Moxostoma anisurum*	X	---	---	---	---	---
64	Skipjack herring	*Alosa chrysochloris*	X	X	X	X	X	X
65	Smallmouth bass	*Micropterus dolomieu*	X	X	X	X	X	---
66	Smallmouth buffalo	*Ictiobus bubalus*	X	X	X	X	---	---

Table C-5. (Continued)

	Common Name	Scientific Name	RFAI 1993-2009	Historic EF/GN/HN 1974-1984	Cove Rotenone 1949-1993	WCF Impingement 1974-1975	WCF Impingement 2005-2007	2009 Qualitative Species Sampling
67	Smallmouth redhorse	*Moxostoma breviceps*	---	---	X	---	---	---
68	Snubnose darter	*Etheostoma simoterum*	X	---	---	---	---	---
69	Spotfin shiner	*Cyprinella spiloptera*	X	X	X	---	X	X
70	Spotted bass	*Micropterus punctulatus*	X	X	X	---	X	X
71	Spotted gar	*Lepisosteus oculatus*	X	X	X	---	---	X
72	Spotted sucker	*Minytrema melanops*	X	X	X	X	X	X
73	Steelcolor shiner	*Cyprinella whipplei*	X	X	X	---	---	X
74	Stripetail darter	*Etheostoma kennicotti*	---	---	X	---	---	---
75	Striped bass	*Morone saxatilis*	X	X	---	---	X	---
76	Suckermouth minnow*	*Phenacobius mirabilis*	---	---	X	---	---	---
77	Threadfin shad	*Dorosoma petenense*	X	X	X	X	X	X
78	Walleye	*Sander vitreus*	X	X	---	X	---	---
79	Warmouth	*Lepomis gulosus*	X	X	X	X	---	X
80	Western mosquitofish	*Gambusia affinis*	X	---	X	---	X	X
81	White bass	*Morone chrysops*	X	X	X	X	X	X
82	White crappie	*Pomoxis annularis*	X	X	X	X	X	---
83	Whitetail shiner	*Cyprinella galactura*	---	---	X	---	---	X
84	White sucker	*Catostomus commersoni*	---	---	---	X	---	---
85	Yellow bass	*Morone mississippiensis*	X	X	X	X	X	X
86	Yellow bullhead	*Ameiurus natalis*	X	X	X	X	X	X
87	Yellow perch	*Perca flavescens*	X	X	X	---	X	X
		Total number of species:	**64**	**43**	**72**	**30**	**38**	**43**

Note: Species are listed alphabetically by common name. Asterisks denote questionable species records. Historic electro-fishing (EF), gill net (GN), and hoop net (HN) data are from TVA 1974b; TVA 1983c; and TVA 1985b. WCF impingement data collected during 1974-1975 are from TVA 1975b. WCF impingement data collected during 2005-2007 are from TVA 2007b.

Table G-6. Individual Metric Ratings and Overall Reservoir Benthic Index (RBI) Scores for Upstream and Downstream Sampling Sites Near Bellefonte Nuclear Plant, Guntersville Reservoir, Spring 2009

Spring 2009 Metric	Downstream TRM 389 Obs	 Rating	Upstream TRM 393.7 Obs	 Rating
1. Average number of taxa	10.4	5	8.3	3
2. Proportion of samples with long-lived organisms	1	5	0.9	5
3. Average number of EPT taxa	1	3	0.9	3
4. Average proportion of oligochaete individuals	12.7	3	9.1	5
5. Average proportion of total abundance comprised by the two most abundant taxa	76.5	3	76	3
6. Average density excluding chironomids and oligochaetes	250.9	1	214.1	1
7. Zero-samples - proportion of samples containing no organisms	0	5	0	5
Reservoir Benthic Index Score		**25 Good**		**25 Good**

Table G-7. Average Mean Density per Square Meter of Benthic Taxa Collected at Upstream and Downstream Sampling Sites Near Bellefonte Nuclear Plant, Guntersville Reservoir, Spring 2009

Taxa	Downstream TRM 389	Upstream TRM 393.7
	Mean Density	Mean Density
Turbellaria		
Tricladida		
Planariidae		
Dugesia tigrina	2	2
Annelida		
Oligocheata		
Lumbriculidae	1	---
Naididae	2	---
Ophidonais serpentina	---	1
Tubificidae	112	111
Limnodrilus hoffmeisteri	14	2
Branchiura sowerbyi	---	1
Hirudinea		
Rhynchobdellida		
Glossiphoniidae		
Helobdella stagnalis	2	---
Crustacea		
Amphipoda		
Corophiidae		
Apocorophium lacustre	---	5
Crangonyctidae		
Crangonyx sp.	5	8
Gammaridae		
Gammarus sp.	31	63
Talitridae		
Hyalella azteca	---	2
Insecta		
Odonata		
Anisoptera		
Gomphidae		
Gomphus sp.	---	1
Libellulidae	---	1
Ephemeroptera		
Caenidae		
Caenis sp.	---	5
Ephemeridae		
Hexagenia limbata <10mm	8	1
Hexagenia limbata >10mm	101	47
Trichoptera		
Leptoceridae	3	1
Oecetis sp.	---	3

Table G-7. (Continued)

Taxa	Downstream TRM 389 Mean Density	Upstream TRM 393.7 Mean Density
Diptera		
Chironomidae		
Ablabesmyia annulata	9	3
Ablabesmyia rhamphe	---	1
Axarus sp.	---	3
Chironomus sp.	15	9
Coelotanypus sp.	233	64
Cricotopus sp.	---	1
Cryptochironomus sp.	3	5
Dicrotendipes neomodestus	2	1
Epoicocladius sp.	4	2
Paracladopelma sp.	4	2
Polypedilum halterale sp.	27	28
Procladius sp.	5	3
Stictochironomus caffrarius	124	77
Tanytarsus sp.	2	---
Coleoptera		
Elmidae		
Dubiraphia sp.	---	1
Hydrophilidae		
Berosus sp.	1	---
Mollusca		
Gastropoda		
Lymnophila		
Ancylidae		
Ferrissia rivularis	1	---
Mesogastropoda		
Hydrobiidae		
Amnicola sp.	---	1
Birgella subglobosa	2	1
Pleuroceridae		
Pleurocera canaliculata	3	16
Viviparidae		
Campeloma decisum	4	---
Bivalvia		
Veneroida		
Corbiculidae		
Corbicula fluminea <10 mm	15	29
Corbicula fluminea >10 mm	72	25
Sphaeriidae		
Pisidium sp.	---	2
Unionoida		
Unionidae		
Potamilus alatus	1	---
Density of organisms per m²	**804**	**525**
Number of samples	**10**	**10**
Total area sampled (m²)	**1.05**	**1.1**

Table G-8. Comparison of RBI Scores from Autumn Sampling Conducted During 1994-2008 as Part of the Vital Signs Monitoring Program in Guntersville Reservoir

Location	Site	1994	1996	1998	2000	2001	2002	2004	2005	2006	2007	2008	Average
Inflow	TRM 420	21	27	23	25	---	25	21	---	23	---	29	**24**
Inflow	TRM 408	---	---	---	23	21	21	---	19	29	25	27	**24**
Inflow	TRM 406.7	---	---	---	23	23	23	---	27	27	27	27	**25**
Transition	TRM 375.2	33	33	33	31	---	31	29	---	29	---	25	**31**
Forebay	TRM 350	27	35	35	23	---	25	35	---	23	---	17	**28**
Downstream of BLN													
Transition	TRM 389	Spring 2009											
		25											
Upstream of BLN													
Transition	TRM 393.7	Spring 2009											
		25											

Note: Spring 2009 RBI scores from sites located upstream and downstream of BLN are also included for comparison.
RBI Scores: 7-12 (Very Poor); 13-18 (Poor); 19-23 (Fair); 24-29 (Good); or 30-35 (Excellent)

APPENDIX H – AGENCY CONSULTATION

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United States Fish and Wildlife Consultation (Alabama, Georgia, and Tennessee)

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Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

November 4, 2009

Mr. Bill Pearson, Supervisor
U.S. Fish & Wildlife Service
Alabama Ecological Services Field Office
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

The Tennessee Valley Authority (TVA) is proposing to construct and operate a single nuclear unit at the Bellefonte Nuclear Plant (BLNP) site in Jackson County, Alabama. This would be accomplished either by completing one of the existing partially built Babcock & Wilcox (B&W) nuclear units or by constructing a Westinghouse AP1000 nuclear unit. The Draft Supplemental Environmental Impact Statement (DSEIS) describing the environmental impacts of these two alternatives in detail will soon be mailed to your office for use in reviewing this project.

Existing TVA transmission lines in Bedford, Coffee, Sequatchie, Hamilton, and Marion Counties, Tennessee; Limestone, Jackson, and Morgan Counties, Alabama; and Catoosa, Walker, and Dade Counties, Georgia, would need upgrading in order to transmit the power generated at the nuclear plant. The enclosed Biological Assessment (BA) analyzes the impacts of single nuclear unit generation at BLNP site, including the associated transmission line upgrades. Some of the transmission lines originating on the BLNP site are presently de-energized. ROWs for these lines would be brought back to current TVA standards for energized lines. Associated right-of-way maintenance the other affected lines would not change based on this proposed project. Therefore, activities related to vegetation maintenance were not assessed in the enclosed BA.

Based on previous conversations with various offices of the U.S. Fish and Wildlife Service (F&WS), TVA will initiate a formal, programmatic Section 7 Endangered Species Act consultation on its right-of-way maintenance. This consultation would be completed before any transmission line upgrades associated with the generation of electricity at BLNP would be needed, and commitments resulting from the programmatic consultation would be incorporated in that work.

The DSEIS will not identify a preferred alternative. There is little difference in operation between the B&W and AP1000 nuclear units. Therefore, the enclosed BA assumes the most inclusive impacts of construction and operation to potentially-affected species.

Mr. Bill Pearson, Supervisor
Page 2
November 4, 2009

TVA has determined that completion or construction and operation of a single nuclear unit at BLNP site in Jackson County, Alabama, would not affect Hine's emerald dragonfly, Sequatchie caddisfly, orangefoot pimpleback, armored snail, royal marstonia, Alabama lampmussel, Alabama moccasinshell, birdwing pearlymussel, cracking pearlymussel, Cumberland monkeyface, Cumberland bean, Cumberland pigtoe, dromedary pearlymussel, fine-lined pocketbook, ring pink, spectaclecase, southern pigtoe, tan riffleshell, boulder darter, palezone shiner, and red-cockaded woodpecker. TVA has determined that the project is not likely to affect Anthony's riversnail, slender campeloma, pale lilliput, slabside pearlymussel, American hart's tongue fern, fleshy-fruit gladecress, green pitcher plant, large-flowered skullcap, leafy prairie-clover, Morefield's leather flower, Price's potato-bean, small whorled pogonia, Virginia spiraea, white fringeless orchid, slackwater darter, snail darter, gray bat, or bald eagle. TVA respectfully requests concurrence for these determinations.

TVA has determined that the project could adversely affect pink mucket and sheepnose (candidate for listing). The enclosed BA provides the details of impacts to these two mussel species from the proposed Bellefonte project. TVA requests that F&WS initiate formal Section 7 consultation for impacts to the pink mucket from this project. TVA requests initiation of formal conference for impacts to the sheepnose.

Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures
cc: Ms. Mary Jennings, Supervisor
U.S. Fish & Wildlife Service
Tennessee Field Office
446 Neal Street
Cookeville, TN 38501

Ms. Karen Marlow
Science Center, Room 229
Samford University
800 Lakeshore Drive
Birmingham, AL 35229-2234

Ms. Sandy Tucker, Field Supervisor
U.S. Fish & Wildlife Service
105 Westpark Drive, Suite D
Athens, GA 30606

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

November 4, 2009

Mr. Bill Pearson, Supervisor
U.S. Fish & Wildlife Service
Alabama Ecological Services Field Office
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS) FOR A SINGLE NUCLEAR UNIT AT THE BELLEFONTE SITE— JACKSON COUNTY, ALABAMA

Enclosed are two draft copies of the draft SEIS, which evaluates Tennessee Valley Authority's (TVA) proposal to complete or construct and operate a single nuclear generating unit at the Bellefonte Nuclear Plant (BLN) site located in Jackson County, Alabama. TVA is requesting your review of the draft SEIS and is accepting comments between November 13 and December 28, 2009.

TVA is considering a No Action Alternative and two Action Alternatives: completion and operation of a Babcock and Wilcox pressurized light water reactor or construction and operation of a Westinghouse AP1000 advanced pressurized light water reactor. Either of the two Action Alternatives would use licensing processes that are already underway. The draft SEIS also evaluates the impact of refurbishing, reenergizing, and upgrading existing electrical transmission infrastructure necessary to accommodate new power generation.

TVA has identified the need for additional base load generation in the 2018 to 2020 time frame. Completion or construction of one additional nuclear unit capable of generating between approximately 1,100 and 1,200 megawatt (MW) of power within this time frame would help address the need for additional base load generation in the TVA power service area and help meet TVA's goal to have at least 50 percent of its generation portfolio comprised of low or zero carbon-emitting sources by the year 2020. Both Action Alternatives proposed would also make beneficial use of existing assets at the BLN site.

This draft SEIS supplements TVA's original 1974 *Final Environmental Statement – Bellefonte Nuclear Plant Units 1 and 2* for the BLN project and updates other related environmental documents including a 2008 environmental report for the AP1000 for BLN Units 3 and 4. TVA will identify its preferred alternative in the final SEIS after receiving input from the reviewing agencies and the public.

Mr. Bill Pearson, Supervisor
November 4, 2009
Page 2

The draft SEIS may be viewed at www.tva.gov/environment/reports/blnp, and comments may be provided to us online. Please note that any comments received, including names and addresses, will become part of the administrative record and will be available for public inspection. To provide written comments or request a printed copy of the draft SEIS, please contact:

Ruth M. Horton
Senior NEPA Specialist
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, TN 37902

Phone: (865) 632-3719
E-mail: rmhorton@tva.gov.

Also, for general project information, contact:

Andrea L. Sterdis
Nuclear Project Manager
Tennessee Valley Authority
1101 Market Street, LP 5A
Chattanooga, TN 37402

Phone: (423) 751-7119
E-mail: alsterdis@tva.gov

Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

November 4, 2009

Ms. Mary E. Jennings, Supervisor
U.S. Fish & Wildlife Service
Tennessee Field Office
446 Neal Street
Cookeville, TN 38501

Dear Ms. Jennings:

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TVA has identified the need for additional base load generation in the 2018 to 2020 time frame. Completion or construction of one additional nuclear unit capable of generating between approximately 1,100 and 1,200 megawatt (MW) of power within this time frame would help address the need for additional base load generation in the TVA power service area and help meet TVA's goal to have at least 50 percent of its generation portfolio comprised of low or zero carbon-emitting sources by the year 2020. Both Action Alternatives proposed would also make beneficial use of existing assets at the BLN site.

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Ms. Mary E. Jennings, Supervisor
November 4, 2009
Page 2

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Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

November 4, 2009

Ms. Sandy Tucker, Field Supervisor
U.S. Fish & Wildlife Service
105 Westpark Drive, Suite D
Athens, GA 30606

Dear Ms. Tucker:

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Ms. Sandy Tucker, Field Supervisor
November 4, 2009
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1101 Market Street, LP 5A
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Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

November 4, 2009

Ms. Karen Marlow
U.S. Fish and Wildlife Service
Science Center, Room 229
Samford University
800 Lakeshore Drive
Birmingham, AL 35229-2234

Dear Ms. Marlow:

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Ms. Karen Marlow
November 4, 2009
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Chattanooga, TN 37402

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Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

November 4, 2009

Ms. Cynthia Dohner
Southeast Regional Director
U.S. Fish and Wildlife Service
1875 Century Boulevard, Suite 400
Atlanta, GA 30345

Dear Ms. Dohner:

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS) FOR A SINGLE NUCLEAR UNIT AT THE BELLEFONTE SITE— JACKSON COUNTY, ALABAMA

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Ms. Cynthia Dohner
November 4, 2009
Page 2

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Nuclear Project Manager
Tennessee Valley Authority
1101 Market Street, LP 5A
Chattanooga, TN 37402
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E-mail: alsterdis@tva.gov

Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

November 4, 2009

Mr. Dwight Cooley, Field Supervisor
U.S. Fish and Wildlife Service
2700 Refuge Headquarters Road
Decatur, AL 35603

Dear Mr. Cooley:

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS) FOR A SINGLE NUCLEAR UNIT AT THE BELLEFONTE SITE— JACKSON COUNTY, ALABAMA

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Mr. Dwight Cooley, Field Supervisor
November 4, 2009
Page 2

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Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Office of Environment and Research

Enclosures

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

DEC 0 7 2009

IN REPLY REFER TO:
2006-F-1022(a)

Peggy W. Shute
Biological Permitting and Compliance
Office of Environment and Research
400 West Summit Hill Drive, WT 11C
Knoxville, TN 37901-1401

Dear Ms. Shute:

This letter acknowledges the U.S. Fish and Wildlife Service's (Service) November 6, 2009, receipt of your November 4, 2009, biological assessment and letter requesting initiation of formal section 7 consultation under the Endangered Species Act (Act). The consultation concerns the possible effects of the Tennessee Valley Authority's (TVA) proposed construction and operation of a single nuclear unit at the Bellefonte Nuclear Plant site in Jackson County, Alabama, on the endangered pink mucket pearlymussel (*Lampsilis abrupta*) and the sheepnose mussel (*Plethobasus cyphyus*), a candidate for listing under the Act.

TVA is considering either the completion of an existing, partially built Babcock & Wilcox nuclear unit, or the construction of a new Westinghouse AP1000 nuclear unit and has not yet identified a preferred alternative in the biological assessment and draft supplemental environmental impact statement (SEIS). We understand that TVA will identify its preferred alternative in the final SEIS after receiving input from the reviewing agencies and the public. As discussed and agreed upon in our November 24, 2009, conference call, the Service will address the possible effects of each of the proposed alternatives in our consultation with TVA.

We concur with your determination that the proposed project will not affect the following endangered (E) threatened (T), and candidate (C) species:

Alabama lampmussel (*Lampsilis virescens*) - E
Alabama moccasinshell (*Medionidus acutissimus*) - T
Armored snail (*Marstonia (=Pyrgulopsis) pachyta*) - E
Birdwing pearlymussel (*Lemiox rimosus (= Conradilla caelata)*) - E
Boulder darter (*Etheostoma wapiti*) - E
Cracking pearlymussel (*Hemistena lata*) – E
Cumberland bean pearlymussel (*Villosa trabalis*) - E
Cumberland monkeyface pearlymussel (*Quadrula intermedia*) - E
Cumberland pigtoe (*Pleurobema gibberum*) - E

www.fws.gov
PHONE: 251-441-5181 TAKE PRIDE IN AMERICA FAX: 251-441-6222

Ms. Peggy W. Shute 2

Dromedary pearlymussel (*Dromus dromas*) - E
Fine-lined pocketbook (*Hamiota altilis*) - T
Hine's emerald dragonfly (*Somatochlora hineana*) – E
Orangefoot pimpleback pearlymussel (*Plethobasus cooperianus*) – E
Palezone shiner (*Notropis albizonatus*) -E
Red-cockaded woodpecker (*Picoides borealis*) - E
Ring pink (*Obovaria retusa*) - E
Royal (obese) marstonia snail (*Marstonia ogmoraphe*) - E
Sequatchie caddisfly (*Glyphopsyche sequatchie*) – C
Southern pigtoe (*Pleurobema georgianum*) - E
Spectaclecase (*Cumberlandia monodonta*) – C
Tan riffleshell (*Epioblasma florentina walkeri* (=*E. walkeri*)) – E

Likewise, we concur with your finding that the proposed project may affect, but is not likely to adversely affect, the following species:

American hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) - T
Anthony's riversnail (*Athearnia anthonyi*) - E
Gray bat (*Myotis grisescens*) E
Green pitcher-plant (*Sarracenia oreophila*) - E
Large-flowered skullcap (*Scutellaria montana*) - E
Leafy prairie-clover (*Dalea* (=*Petalostemum*) *foliosa*) - E
Morefield's leather-flower (*Clematis morefieldii*) - E
Pale lilliput pearlymussel (*Toxolasma cylindrellus*) - E
Price's potato-bean (*Apios priceana*) - T
Slabside pearlymussel (*Lexingtonia dolabelloides*) - C
Slackwater darter (*Etheostoma boschungi*) - T
Slender campeloma (*Campeloma decampi*) - E
Small whorled pogonia (*Isotria medeoloides*) - T
Snail darter (*Percina tanasi*) - T
Unnamed gladecress (*Leavenworthia crassa*) - C
Virginia spiraea (*Spriraea virginiana*) - T
White fringeless orchid (*Platanthera integrilabia*) - C

All information required of you to initiate consultation on the possible effects of the proposed construction and operation of a single nuclear unit at the Bellefonte Nuclear Plant site in Jackson County, Alabama, on the endangered pink mucket pearlymussel (*Lampsilis abrupta*) and the sheepnose mussel (*Plethobasus cyphyus*) was either included with your letter or is otherwise accessible for our consideration and reference. We have assigned log number 2006-F-1022(a) to this consultation. Please refer to that number in future correspondence on this consultation.

Section 7 allows the Service up to 90 days to conclude formal consultation with your agency and an additional 45 days to prepare our biological opinion (unless we mutually agree to an extension). Therefore, we anticipate completing the consultation by February 4, 2010, and the biological opinion by March 22, 2010.

As a reminder, the Endangered Species Act requires that after initiation of formal consultation, the Federal action agency make no irreversible or irretrievable commitment of resources that limits future options. This practice insures agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitats.

If you have any questions or need additional information, please contact Ms. Karen Marlowe of my staff at (205) 726-2667. Please use the reference number located at the top of this letter in future phone calls or written correspondence.

Sincerely,

William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office

cc: USFWS, Ecological Services, Asheville, NC
USFWS, Ecological Services, Cookeville, TN
USFWS, Ecological Services, Jackson, MS
USFWS, Ecological Services, Frankfort, KY
USFWS, Ecological Services, Clemson, SC
USFWS, Ecological Services, Chicago, IL

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

1/25/10

JAN 2 1 2010

IN REPLY REFER TO:
2006-F-1022

Peggy W. Shute
Biological Permitting and Compliance
Office of Environment and Research
400 West Summit Hill Drive, WT 11C
Knoxville, TN 37901-1401

Dear Ms. Shute:

This letter follows up our December 7, 2009, acknowledgement of receipt of your November 4, 2009, biological assessment and letter requesting initiation of formal section 7 consultation under the Endangered Species Act of 1973, as amended (Act). In the course of our review of the Tennessee Valley Authority's (TVA) proposed construction and operation of a single nuclear unit at the Bellefonte Nuclear Plant site in Jackson County, Alabama, with associated transmission line upgrades and the proposed project's effects on the endangered pink mucket pearlymussel (*Lampsilis abrupta*) and candidate sheepnose mussel (*Plethobasus cyphyus*), we have concluded that there will be no effect to the sheepnose mussel.

The only record of a sheepnose in recent history anywhere near the Bellefonte site is the discovery of a single, old, weathered shell near the plant during the mussel and snail surveys that were conducted for the biological assessment (Charles Howard, pers. comm. 2010; Gerry Dinkins, pers. comm. 2009) and there are no records of the sheepnose upstream of Interstate 65 at Decatur, Alabama (Jeff Garner, pers. comm. 2010). We, therefore, intend to consult only on the effects of the proposed Bellefonte Nuclear Plant project on the endangered pink mucket pearlymussel. We continue to anticipate completing the consultation by February 4, 2010, and the biological opinion by March 22, 2010.

If you have any questions or need additional information, please contact Ms. Karen Marlowe of my staff at (205) 726-2667. Please use the reference number located at the top of this letter in future phone calls or written correspondence.

Sincerely,

William J. Pearson

William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office

www.fws.gov

PHONE: 251-441-5181 TAKE PRIDE IN AMERICA FAX: 251-441-6222

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

March 18, 2010

Mr. William J. Pearson, Field Supervisor
Alabama Ecological Services Field Office
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

On November 4, 2009, the Tennessee Valley Authority (TVA) submitted a Biological Assessment (BA) and request for formal consultation (according to Section 7 of the Endangered Species Act) to your office for the TVA project entitled "Proposed Single Unit Nuclear Plant Development at Bellefonte Nuclear Site and Associated Transmission line upgrades, in Alabama, Tennessee, and Georgia" (USFWS ID: 2006-F-1022). As a result of the BA, TVA determined that the project was likely to adversely affect the federally-listed-as-endangered pink mucket pearlymussel (*Lampsilis abrupta*). After consultation with your office and further evaluation of the project's impacts to pink mucket, TVA has committed to additional protective measures that would help minimize the project's adverse impacts to pink mucket, which are in addition to measures and best management practices previously described in the BA.

Our evaluation of impacts determined that the project would directly affect 25,455 m^2 of mussel habitat and indirectly affect 89,876 m^2 of habitat in the Tennessee River within the intake channel, overbank area near the intake channel, barge slip area, and effluent mixing zone (areas combined). Based on relative densities of mussels found within the action area and assumptions about the frequency of pink mucket, TVA determined that a total of five adult pink mucket could be directly taken via harm or kill and that 63 adult pink mucket could be indirectly taken via harm.

The effort and cost associated with translocating these mussels from the project area (even if restricted to areas of direct impacts only) to a suitable location within the Tennessee River and monitoring their health would be extraordinary, especially when considering the relative benefit to the species and generally poor or marginal habitat for pink mucket (and most other unionid mussel species) within the proposed action area. Therefore, in lieu of translocation as a protective measure, TVA would commit to funding other conservation actions aimed to recover pink mucket and its habitat.

To determine an appropriate amount of funding for this proposed Bellefonte project, we compared the potential adverse impacts of the proposed project with impacts from a recently permitted project for a barge loading facility at Tennessee River mile 424 upstream from the Bellefonte Nuclear Plant site at the head of Guntersville Reservoir (Biological Assessment: Proposed Fabrication and Loading Facility by Chicago Bridge

Mr. William J. Pearson, Field Supervisor
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March 18, 2010

and Iron [CBI] Company [Marion County, Tennessee], TVA 2008). For the CBI project, the applicant committed to $25,000 that would be used for pink mucket recovery. The applicants also committed to two years of post-construction mussel monitoring and reporting to identify project impacts within and adjacent to the CBI action area.

The proposed Bellefonte project would directly take fewer pink mucket than the CBI project (5 vs. 17 individuals, respectively), and indirectly take slightly fewer pink mucket (62 vs. 66 individuals, respectively). The proposed Bellefonte project would directly affect substantially more habitat than the CBI project (25,455 m^2 vs. 3,300 m^2). However, mussel habitat quality at the Bellefonte site, particularly in areas to be directly affected by dredging impacts, is relatively poor compared to habitat present at the CBI site. At the Bellefonte site, mussel density is 0.12 - 0.81 mussels/m^2 vs. 4.76 mussels/m^2 at the CBI site. TVA has taken into consideration both the area affected and the quality of the mussel habitat in developing its proposed mitigation.

TVA would commit a total of $30,000 to be used for research and recovery of pink mucket to mitigate impacts to the species that would result from constructing and operating a single nuclear unit at the Bellefonte Nuclear site. However, TVA does not stipulate the use of these monies for specific projects. If funding more general research evaluating impacts of water-based facilities (like the Bellefonte Nuclear site) to mussel habitats in the mainstem Tennessee River were of interest to the U.S. Fish and Wildlife Service, TVA would not object to this use of funds.

If you have questions about these additional commitments, please contact me or Chuck Howard at (865) 632-2092.

Sincerely,

Original signed by

Peggy W. Shute, Manager
Biological Permitting and Compliance
Endangered Species Act Compliance Officer
Office of Environment and Technology

Emailed copy provided to Karen Marlow, U.S.F&WS, Birmingham, AL

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

IN REPLY REFER TO

APR 1 5 2010

2006-F-1022

Peggy W. Shute
Tennessee Valley Authority
Biological Permitting and Compliance
Office of Environment and Research
400 West Summit Hill Drive, WT 11C
Knoxille, TN 37901-1401

Dear Ms. Shute:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on the Service's review of the Tennessee Valley Authority's (TVA) proposed construction and operation of a single nuclear unit at the Bellefonte Nuclear Plant (BLN) site in Jackson County, Alabama, and its effects on the endangered pink mucket (pearlymussel) (*Lampsilis abrupta*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The proposed project includes associated transmission line upgrades in Bedford, Coffee, Sequatchie, Hamilton and Marion Counties, Tennessee; Limestone, Jackson and Morgan Counties, Alabama; and Catoosa, Walker and Dade Counties, Georgia. The November 4, 2009, request for formal consultation was received on November 6, 2009.

This biological opinion is based on information provided in the November 4, 2009, biological assessment (BA) titled *Biological Assessment: Proposed Single Unit Nuclear Plant Development at Bellefonte Nuclear Site and Associated Transmission Line Upgrades, Alabama, Tennessee, and Georgia*; the November 2009 draft Supplemental Environmental Impact Statement (SEIS); survey reports; available literature; and other sources of information. A complete administrative record of this consultation is on file in the Alabama Field Office located in Daphne, Alabama.

Consultation History

- July 17, 2006: NuStart Energy Development, LLC, (NuStart) wrote a letter to the Service's Daphne, Alabama, field office (Alabama FO) seeking information on threatened, endangered, and candidate species and habitats in and around the 1,600-acre Bellefonte site being considered for an advanced technology nuclear power plant.
- August 17, 2006: The Alabama FO wrote a response to NuStart providing a species list, recommending surveys, and requesting additional information on the proposed project.

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Ms. Peggy W. Shute 2

- September 6, 2006: TVA wrote a letter to the Alabama FO, clarifying NuStart's role in the Nuclear Regulatory Commission (NRC) combined construction and operating license process for the Bellefonte plant site.
- November 6, 2006: Enercon Services, Inc., (Enercon) the environmental contractor for NuStart, called the Alabama FO requesting information on the State of Alabama's thermal limits and clarification on the surveys needed for the pink mucket and Anthony's riversnail (*Athearnia anthonyi*).
- January 21, 2007: Enercon acknowledged the Service's August 17, 2006, letter, to NuStart and provided further information in response to some of the Service's recommendations and concerns.
- February 1, 2007: A meeting at Wheeler National Wildlife Refuge between the Service, Enercon, and TVA was held to further discuss the Service's issues and concerns and Enercon's responses and data gathered to date.
- June 18, 2007: The Alabama FO received the aquatic mussel survey report from Mainstream Commercial Divers, Inc, the consultant hired by Enercon. Survey efforts found no threatened or endangered mussel species along any of the 22 transects.
- February 12, 2008: Enercon transmitted a winter plant habitat survey report to the Alabama FO, stating there was no habitat present within the project footprint for listed plants.
- February 26, 2008: In a telephone conversation with Enercon, the Alabama FO recommends surveys during the flowering/fruiting period for the threatened Price's potato-bean (*Apios priceana*) and endangered Morefield's leather flower (*Clematis morefieldii*).
- February 26, 2008: The NRC sent a letter to the Service's Regional Director in Atlanta, Georgia, requesting a list of protected species within the area under evaluation for the Bellefonte Nuclear Plant, Units 3 and 4 combined license application. The letter was received by the Alabama FO on November 18, 2008.
- December 22, 2008: The Alabama FO responded to the NRC, summarizing the past survey recommendations and results, and recommending surveys for the Price's potato-bean and Moorefield's leather flower during the flowering/fruiting period.
- August 27, 2009: A meeting between TVA and the Service was held in the Service's Cookeville, Tennessee, field office to discuss an appropriate process and timeline for conducting the endangered species section 7 consultation for the proposed Bellefonte Nuclear Plant project.
- October 1, 2009: A meeting between TVA and the Service was held in Birmingham, Alabama. The meeting was called by TVA to provide the Service with a summary of the proposed construction and operation of a nuclear unit at the Bellefonte Nuclear Power Plant and to discuss the upcoming release of the draft SEIS and submission of the BA.
- November 6, 2009: The Alabama FO receives TVA's BA and letter requesting initiation of formal consultation for the construction and operation of a single nuclear unit at Bellefonte Nuclear Plant and its effects on the endangered pink mucket (pearlymussel) and the candidate sheepnose mussel (*Plethobasus cyphyus*).

- November 23, 2009: The Alabama FO received the draft SEIS for a single nuclear unit at Bellefonte Nuclear Plant.
- November 24, 2009: A conference call between TVA and the Service was held to clarify the project alternative(s) to be addressed in the formal consultation.
- December 7, 2009: The Alabama FO sent a letter to TVA acknowledging receipt of the BA and initiating formal consultation.
- January 21, 2010: The Alabama FO sent a letter to TVA stating that, given the fact that there were no current records of the sheepnose within the project area, the proposed project would have no effect on this candidate species.
- March 1, 2010: The Alabama FO sent the draft biological opinion (BO) to TVA for review.
- March 18, 2010: TVA sent comments on the draft BO and revised the project description to include a commitment to provide $30,000 for research and recovery of pink mucket.
- April 1, 2010: Alabama FO staff met with TVA to discuss and flesh out the pink mucket recovery project to be included as part of the project description in the BO.

Table 1. Species and critical habitat evaluated for effects and those where the Service has concurred with a "not likely to be adversely affected" determination.

ENDANGERED (E), THREATENED (T), OR CANDIDATE (C) SPECIES or CRITICAL HABITAT	PRESENT IN ACTION AREA	PRESENT IN ACTION AREA BUT "NOT LIKELY TO BE ADVERSELY AFFECTED"
American hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) - T	Yes	Yes
Anthony's riversnail (*Athearnia anthonyi*) - E	Yes	Yes
Gray bat (*Myotis grisescens*) E	Yes	Yes
Green pitcher-plant (*Sarracenia oreophila*) - E	Yes	Yes
Large-flowered skullcap (*Scutellaria montana*) - E	Yes	Yes
Leafy prairie-clover (*Dalea* (=*Petalostemum*) *foliosa*) - E	Yes	Yes
Morefield's leather-flower (*Clematis morefieldii*) - E	Yes	Yes
Pale lilliput pearlymussel (*Toxolasma cylindrellus*) - E	Yes	Yes
Price's potato-bean (*Apios priceana*) - T	Yes	Yes
Slabside pearlymussel (*Lexingtonia dolabelloides*) -	Yes	Yes

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C		
Slackwater darter (*Etheostoma boschungi*) - T	Yes	Yes
Slender campeloma (*Campeloma decampi*) - E	Yes	Yes
Small whorled pogonia (*Isotria medeoloides*) - T	Yes	Yes
Snail darter (*Percina tanasi*) - T	Yes	Yes
Unnamed gladecress (*Leavenworthia crassa*) - C	Yes	Yes
Virginia spiraea (*Spriraea virginiana*) - T	Yes	Yes
White fringeless orchid (*Platanthera integrilabia*) - C	Yes	Yes

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

This project description is taken from the BA and draft SEIS. The action evaluated in this consultation is TVA's proposed construction and operation of a single nuclear unit at the Bellefonte Nuclear Plant site in Jackson County, Alabama, with associated transmission line upgrades. TVA intends to either complete and operate one of the partially constructed Babcock & Wilcox (B&W) pressurized light water reactor units on the BLN site (BLN *unit 1 or 2*) or construct and operate a new Westinghouse AP1000 advanced pressurized light water reactor at the site. A preferred alternative has not yet been identified. TVA intends to identify its preferred alternative in the final SEIS for the proposed project. This consultation, therefore, addresses the possible effects of each of the proposed alternatives on the endangered pink mucket.

The **Action Area** (Figures 1 and 2) extends from approximately Tennessee River mile (TRM) 392.4 to TRM 390.8, and includes the 1,200-foot (ft) (366-meter (m)) long, 330-ft (101 m) wide intake channel connecting Guntersville Reservoir with the BLN intake pumping station; the mainstem river portion, or intake channel overbank, for which the effects of dredging will extend approximately 580 ft (177 m) out from the riverward boundary of the intake channel proper; the barge terminal, which is located in a small embayment along the right bank of the river at the downstream margin of the BLN site; and, the area (i.e., the mixing zone) within the Tennessee River that is expected to be directly and indirectly impacted by effluent (thermal and chemical) discharges from an existing two-pipe multiport diffuser located at the downstream margin of the barge terminal embayment and extending approximately 430 ft (131 m) into the river. The action area also includes the BLN site itself, located on the peninsula bounded by the Tennessee River and Town Creek at TRM 391.5, and the sites in

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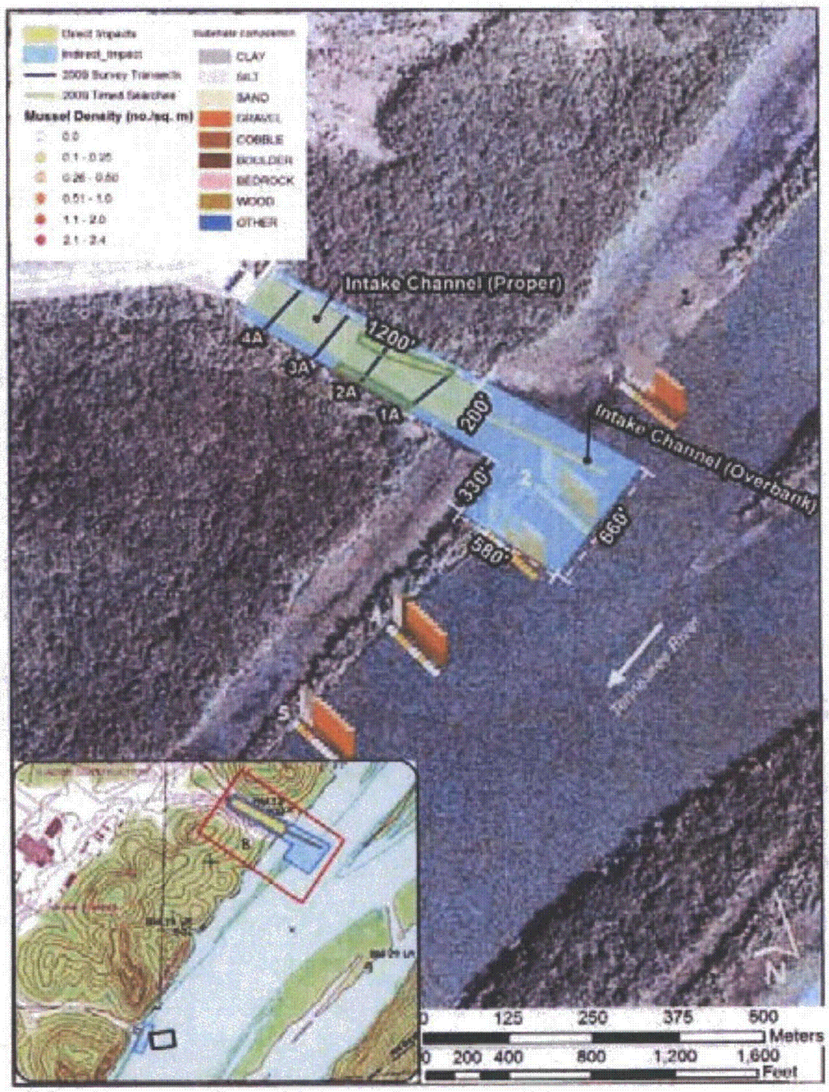

Figure 1. Intake channel and intake channel overbank.

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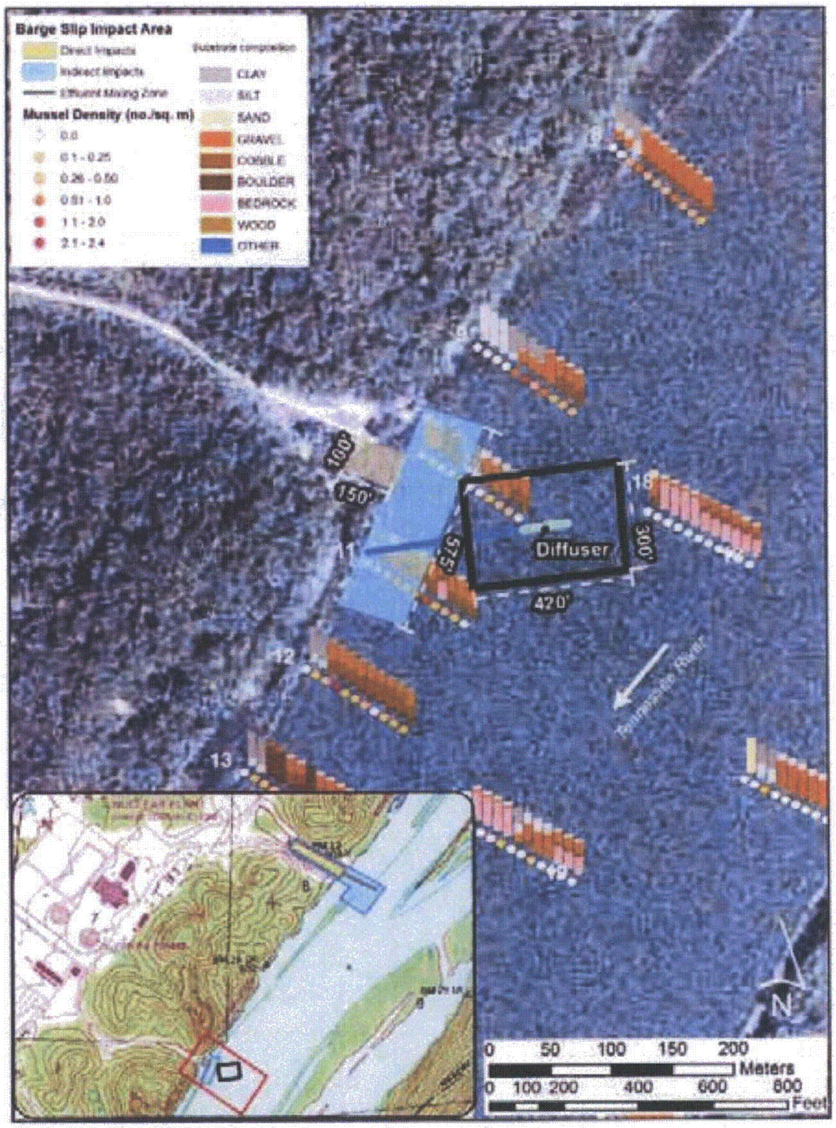

Figure 2. The mixing zone and barge terminal.

which transmission line upgrades are planned in association with the BLN construction and operation; however, as summarized in Table 1 (above), no endangered, threatened, or proposed species are likely to be adversely affected by the proposed construction activities on land at the BLN site and by the transmission line upgrades.

Dredging

Intake Channel

For both alternatives, dredging of the cooling water intake channel, which is located at the upstream boundary of the BLN site, will be necessary to remove fine sediments prior to the facility operation, along with maintenance dredging every 5-10 years. Approximately 10,000 cubic yards of dredged material will be removed from a 240,000 square foot (5.5 acre) area, from the pumping station to the trash boom (ca. 1,200 ft. or 366 m).

Intake Channel Overbank

For the B&W reactor, an additional 11,100 cubic yards of material will be removed from the trash boom to the main river channel (i.e., the intake channel overbank) (ca. 760 ft (232 m) long and 25 ft (7.62 m) wide), extending 580 ft (177 m) into the Tennessee River from the intake channel proper. Direct and indirect impacts from the intake channel and intake channel overbank dredging are expected to encompass an area extending from slightly upstream of the intake channel overbank to 330 ft (101 m) downstream.

Barge Unloading Dock

For both the B&W reactor and the AP1000 reactor, the unloading dock will be refurbished. No additional dredging at the barge unloading dock will be required for the B&W reactor; however, approximately 240 cubic yards of material will need to be dredged from an area in the embayment measuring approximately 150 ft (46 m) long and 100 ft wide (30.5 m) (=15,000 square ft or .34 acres) for the AP1000 reactor. Direct and indirect impacts from the dredging of the embayment for the AP1000 reactor are expected to extend from slightly upstream of the embayment to 330 ft (101 m) downstream.

All dredged material will be disposed of on-site in an approved area above the 500-year flood elevation.

Barge Traffic

Under both alternatives, barges will be used to transport heavy equipment, large reactor components, construction modules too large to ship by train, and removal of construction debris and other waste from the site.

Thermal and Chemical Discharges

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The type of thermal and chemical discharges from the two-pipe multiport diffuser located at the downstream margin of the barge terminal embayment and extending approximately 430 ft (131 m) into the river channel will be similar for both the B&W reactor and the AP1000 reactor, although slightly reduced for the AP1000 reactor (i.e., the AP1000 discharge would be 36 percent of that associated with a B&W reactor). As permitted under BLN's NPDES permit number AL0024635, the discharges consist of cooling tower blowdown and other wastewater resulting from electric power generation. The discharge temperature limitations (92°/95° F or 33°/35°C) ensure that the temperature at the edge of the mixing zone will not exceed 90°F (32°C), the temperature considered protective of maintaining a balanced indigenous population of fish, shellfish, and aquatic life (ADEM 1998; TVA 1982). The mixing zone (i.e., the limits of where thermal and chemical effects from the diffuser would be felt) encompasses a 250-ft (76 m) radius from the diffuser in all directions (Figure 3).

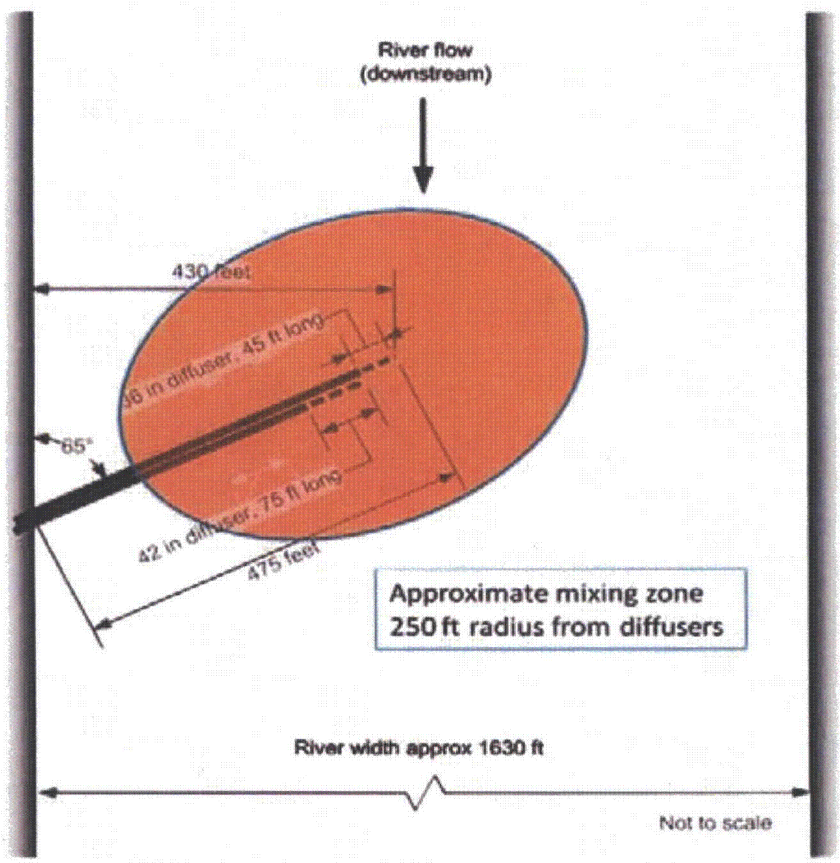

Figure 3. Diffuser and mixing zone

Conservation Measure Proposed as Part of the Action

In accordance with the Service's draft 5-year review (Service 2009) and recommendations for reintroduction and augmentation outlined in the draft "Plan for the Controlled Propagation, Augmentation and Reintroduction of Freshwater Mollusks of the Cumberlandian Region" prepared by the Cumberlandian Region Mollusk Restoration Committee (2009), TVA will provide $30,000 to the Alabama Aquatic Biodiversity Center (AABC) for the reintroduction and/or augmentation of pink mucket and other high priority mollusks within their historic ranges. The reintroduction/augmentation project will be funded by TVA prior to the initiation of dredging activities described above.

STATUS OF THE SPECIES/CRITICAL HABITAT

Listed species/critical habitat description

The pink mucket was listed as endangered without critical habitat on June 14, 1976 (41 FR 24062-24067). The preferred habitat of this species is in medium to large rivers in habitat ranging from silt to boulders, rubble, gravel, and sand substrates (Hickman 1937; Yokley 1972; Buchanan 1980; Clarke 1982, as cited in Service 1985). It is generally found in larger streams and rivers in moderate to fast-flowing water, at depths ranging from 1.5 to 26 ft (0.5 to 8.0 m) (Service 1985). Historically, it was known from the Tennessee, Cumberland, and Ohio River systems with occasional records from the Mississippi River system (Service 1985). Recent sampling efforts and a more thorough search of historical records documents historic populations in at least 48 streams (Service 2009). The species has become extirpated in at least 19 streams, and is currently known from only 29 streams within the Ohio, Cumberland, Tennessee, Missouri, Mississippi, White, and Red River systems (Service 2009). Over one-third of these populations are represented by only one or two individuals found over the past 25 years, and 16 populations (55%) are restricted to less than 16 river miles (Service 2009).

Life history

Like most naiads, male pink muckets release sperm into the water, where females downstream obtain the sperm through siphoning. Fertilization of the eggs occurs within the gills of the female. The female retains the fertilized eggs in the posterior section of the outer gills until they partially develop into a young life stage called glochidia. The glochidia are discharged into the water by the female either singly or in groups, depending on the species. Within three or four days, they must attach to a suitable fish host, encysting on gill filaments, opercles, or fins. If the glochidium is unsuccessful in attaching to the appropriate fish host, it will die. During the period of attachment to the host fish, which may last for several days or weeks depending on the species, the encapsulated glochidium develops into a juvenile mussel and drops from the host to begin growth on the stream bottom. Appropriate stream bottom habitat conditions must be present for the mussel to develop into an adult.

The pink mucket has been reported as gravid in August, September, October, November, and January (Gordon and Layzer 1989 and citations therein), with the glochidia overwintering and being released the following June (Service 1985). Host fish include largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), spotted bass (*Micropterus punctulatus*), and walleye (*Sander vitreus*) (Barnhart *et al.* 1997), as well as white crappie (*Pomoxis annularis*) and sauger (*Sander canadense*) (J.B. Layzer and L.M. Madison, USGS, pers. comm., in Williams *et al.* 2008).

Like most mussel species, the pink mucket is believed to be long-lived -- up to 50 years (Service 1985). A pond propagation study that took place in 2006 in the Tennessee River, Tennessee, indicates that female pink muckets reach sexual maturity at 2+ years of age (D.W. Hubbs, Tennessee Wildlife Resources Agency, pers. comm. 2009, in Service 2009).

Population dynamics

The pink mucket populations that remain are, with few exceptions, extremely small and occur in relatively short river reaches. Over one-third of the populations are represented by only one or two individuals found over the past ~25 years and 16 populations (55%) are restricted to ≤ 16 river miles (Service 2009).

Within the Ohio River in Ohio, West Virginia, Kentucky, and Illinois, the pink mucket occupies its largest stretch of river but individual records may be several hundred miles apart (Service 2009). The pink mucket in the Ohio River has been severely impacted by the invasive zebra mussel (*Dreissena polymorpha*), navigational activities, industrial pollution, and stochastic events, and appears to be in decline (Service 2009).

In the Kanawha River in West Virginia, the pink mucket occupies only ~5 RM, and appears to be stable (B. Douglas, Service, pers. comm. 2004 in Service 2009), with recruitment documented in 1999 (Douglas ca. 1999). In the Elk River, West Virginia, the population is considered to be non-recruiting (H.L. Dunn, Ecological Specialists Inc. (ESI), pers. comm. 2009 in Service 2009), and the status of this population is currently unknown (Service 2009).

In Kentucky, the pink mucket inhabits Licking River, Green River, and Barren River. Its status is unknown in Licking and Barren Rivers, and is declining in the Green River (Service 2009). In the Cumberland River of Tennessee, the pink mucket population is considered stable, although recruitment has not yet been verified (Service 2009).

The pink mucket population in the Tennessee River of Alabama, Tennessee, and Kentucky represents the best pink mucket population east of the Mississippi and is one of the top two rangewide (Service 2009). The species was historically distributed throughout the ~650 river mile (RM) main stem of the Tennessee River. It now occupies ~250 RMs of Tennessee River tailwaters downstream of Wilson and Guntersville Dams (Mirarchi *et al.*, 2004; Service 2009). There is evidence of recruitment and the population continues to improve in status in Guntersville (J.T. Garner, DCNR, pers. comm. 2009, in Service 2009) and Pickwick Landing tailwaters (D.W. Hubbs, TWRA, pers. comm. 2008, in Service 2009). The current status of pink mucket populations elsewhere in Tennessee (Holston River, French Broad River, Clinch River) and Alabama (Paint Rock River and Bear Creek) is unknown (Service 2009).

In the Black and Spring Rivers of Arkansas and Missouri, recruitment is occurring (Hutson and Barnhart 2004; J.L. Harris, *Arkansas Highway and Transport Department* (AHTD), pers. comm. 2004, 2009 in Service 2009) and the populations are considered stable (Harris *et al.* 1997. In Missouri, populations are declining in the Osage, Sac, Gasconade, Meramec, Bourbeuse, and Big Rivers, and the status of the St. Francis River population is currently unknown (Service 2009). In Arkansas, the Ouachita and Saline River populations appear to be recruiting and are considered stable (Harris *et al.* 1997; J.L. Harris, AHTD, pers. comm. 2009 in Service 2009), while the status of the White River, Current River, Eleven Point River, and Little Missouri River populations is unknown (Service 2009).

The pink mucket is sporadically distributed and rare in Bayou Bartholomew (Service 2009), which drains portions of Arkansas and Louisiana and is one of the longest rivers in the U.S. that is unchannelized and undammed its entire length (Brooks *et al.* 2008). The status of this population is currently unknown.

Status and distribution

The pink mucket was historically widespread, but rare throughout its range (Service 1985). This species currently exists in 29 streams, with a total occupied linear range estimated at approximately 1,300 RMs. Historically, the pink mucket occupied approximately 6,700 RMs in at least 48 streams in the lower half of the Mississippi River basin. Thus, there has been an 80% loss of the historical distribution of the pink mucket over the past century (Service 2009).

A variety of threats contributed to the historical decline of the pink mucket, including the development of impoundments for recreation, navigation, flood control, water supply, and electricity, siltation from other human activities, and pollution (Service 1985). In addition to these ongoing threats, extant populations are primarily impacted by reservoir releases, mining practices, industrial discharges, stochastic events, and factors associated with small disjunct populations (Service 2009). Impoundments may adversely impact riverine mussels by killing them during project construction and dredging, suffocating them with accumulated sediments, reducing food and oxygen availability by the reduction of water flow, and extirpating host fish, at least on a local basis. In addition, the impoundments have isolated surviving populations of these mussel species and their associated fish hosts, which may result in decreased genetic diversity and also reduce species' reproductive and recruitment potential.

Other forms of habitat modification include channelization, channel clearing, and desnagging, which may result in streambed scour and erosion, increased turbidity, reduction of groundwater levels, sedimentation, and changes in aquatic community structure. Human activities that historically and currently introduce large quantities of sediment into streams in the Tennessee River drainage include channel modification, agriculture, forestry, mining, and industrial and residential development.

Other types of water quality degradation resulting from point and non-point pollution sources may also affect listed species. Discharges into streams from both these sources may result in decreased dissolved oxygen concentration, increased acidity or conductivity, and other changes in water chemistry that may affect mussels and/or their host fishes.

Table 2. Biological Opinions within the Alabama Field Office boundaries that have been issued for adverse impact to the pink mucket.

OPINIONS[1]	SPECIES	NUMBERS[2]	HABITAT[3]	
			Critical Habitat	Habitat
1994/2	Pink mucket	Not able to determine	NA	~1,800 cubic yards
1995/1	Pink mucket	1	NA	NA
1996/1	Pink mucket	5% of pop.	NA	NA
1997/1	Pink mucket	Not able to determine		~1,800 cubic yards
2000/1	Pink mucket	17	NA	NA
2002/1	Pink mucket	1	NA	1.4 acre

[1] Year/Number of Opinions
[2] The number of individuals of the species that will be lost
[3] Acres, cubic yards, miles of stream or shoreline of critical habitat and non-critical habitat that would be lost or modified.

ENVIRONMENTAL BASELINE

Status of the species within the action area

Pink mucket is rare within the action area. The most recent records of pink mucket in and near the action area were in 2008, when it was found above the action area, just below Nickajack Dam at Tennessee RM 424 and estimated to comprise 0.11% of the mussel community (Lewis 2008), and in 2009, when one live individual was found immediately adjacent to the BLN site at a depth of 25 ft (7.6 m) in a substrate composed of 50% cobble, 40% gravel, and 10% sand (Dinkins 2009). Dinkins (2009) also collected one dead shell in the main channel.

Factors affecting species' environment within the action area

Impoundment of the Tennessee River and its tributaries has likely had the most extensive adverse impacts on populations of the pink mucket within the action area. Construction of dams converted large reaches of free-flowing riverine habitat to lake-like conditions. Along with alteration of the physical habitat, this change also resulted in changes in the fish fauna. Fish species adapted to lake habitats replaced native riverine fishes that served as fish hosts for the mussels. Streambank erosion, poor land use practices, dredging, municipal and industrial discharges, and development along the river have disturbed, altered, or destroyed habitat used by the pink mucket (Service 2004).

However, as detailed in the Service's 2004 biological opinion for TVA's proposed Reservoir Operations Study (ROS) located in the Tennessee River Valley in Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia, TVA has implemented a variety of programs to improve conditions for aquatic resources. Specifically, TVA maintains established minimum flows and minimum dissolved oxygen levels in tailwaters and conducts substantial monitoring of environmental parameters, evaluation of ongoing environmental impacts, and systematic mitigation for large-scale impacts. An example is the Reservoir Release Improvement Program (RRI Program). The RRI Program was initiated to improve water quality and aquatic habitat in tributary tailwaters by providing minimum flows and increasing dissolved oxygen content. Under this program, TVA has restored levels of dissolved oxygen in over 300 miles downstream of 16 projects. Another TVA activity attempts to stabilize reservoir levels for a 2-week period when water temperatures reach 65°F (18°C) at a depth of 5 ft (1.5 m). This fish spawning operation minimizes water level fluctuations during the peak spawning period to avoid more than a 1-foot-per-week (.3-meters-per week) change (either lowering or rising) in pool levels. Stabilizing reservoir levels aids fish spawning success. These and other programs, such as the Vital Signs Monitoring Program, which rates environmental conditions in reservoirs using a reservoir specific fish and benthic Index of Biotic Integrity (IBI), may benefit mussel resources in the Tennessee River, including federally listed species, because fish play a vital role in the life cycles of mussels (Service 2004).

EFFECTS OF THE ACTION

Factors to be considered

The primary effects of the proposed construction and operation of a single nuclear unit at BLN are direct and indirect impacts associated with the dredging of the intake channel, intake channel overbank, and barge unloading terminal, and the direct and indirect impacts of the thermal and chemical releases from the coolant water effluent.

Analysis for the effects of the action

Dredging will directly harm or kill mussels inhabiting the sediment within the intake channel (for both B&W and AP1000 reactors), the intake channel overbank (B&W), and the barge unloading terminal (AP1000) areas. The resulting mobilization of sediments, such as silt and sand, may harm or kill mussels downstream, where such sediments may smother mussels or otherwise compromise respiration, feeding, and reproduction. Dredging in the barge terminal area is anticipated to be necessary only once, while dredging in the intake channel and overbank areas will need to be done every 5 to 10 years.

The operation of barges for the transportation of heavy equipment, large reactor components, construction modules too large to ship by train, and removal of construction debris and other waste from the site will result in brief periods of extreme turbulence, increased suspended sediments, scouring of substrate (and possibly mussels) from the riverbed, and accumulation of fine sediments in surrounding areas as a result of tow propeller wash. These impacts could result in direct harm or killing of mussels (i.e., scouring of substrate) and interference with respiration, feeding, and reproduction.

Species' response to the proposed action

Given the pink mucket's rarity in the action area, its disparate occurrences throughout the Tennessee River, and its low resilience to changes in its habitat, it is unlikely that this species would recolonize areas that have been dredged or areas that have otherwise been rendered unsuitable as a result of this proposed project in the foreseeable future.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Large recreational boats and barge traffic that move upriver and downriver through the action area likely have some effect on aquatic species and habitats. Propeller wash creates waves that erode the riverbanks, resulting in sediment deposit on the river bottom. Runoff from adjacent agricultural fields may contain fertilizers and/or pesticides that can affect aquatic organisms. Residential, commercial, and industrial development around Guntersville Reservoir is likely to continue, resulting in destruction or alteration of aquatic and terrestrial habitats. These effects have occurred over many years and are likely to continue.

CONCLUSION

After reviewing the current status of the pink mucket, the environmental baseline for the action area, the effects of the proposed construction of a single nuclear unit at BLN, and the cumulative effects, it is the Service's biological opinion that the proposed completion and operation of one of the partially constructed Babcock & Wilcox (B&W) pressurized light water reactor units on (BLN unit 1 or 2) or construction and operation of a new Westinghouse AP1000 advanced pressurized light water reactor at the BLN site, as proposed, is not likely to jeopardize the continued existence of the pink mucket. No critical habitat has been designated for the species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary for listed species and must be undertaken by TVA for the exemption in section 7(o)(2) to apply. TVA has a continuing duty to regulate the activity covered by this incidental take statement. If TVA fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, TVA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)]

AMOUNT OR EXTENT OF TAKE ANTICIPATED

If the B&W alternative is chosen by TVA, the Service expects that 68 pink muckets and an unknown number of larvae could be taken. If the AP1000 alternative is chosen, 33 pink mucket and an unknown number of larvae could be taken (Table 3). The incidental take is expected to be in the form of harm and kill.

Dredging of the intake channel proper, a 240,000 ft^2 (22,297 m^2) area where the total mussel density is estimated by Dinkins (2009) as 0.12 mussels/m^2, 0.1% of which is estimated to be pink mucket (Lewis 2008), could result in direct killing or harm of 3 pink muckets. Dredging the overbank portion of the intake channel, a 19,000 ft^2 (1,765 m^2) area where the total mussel density is estimated as 0.81 mussels/m^2 (Dinkins 2009), 0.1% of which is estimated to be pink mucket (Lewis 2008), could result in direct killing or harm of 2 pink muckets. Dredging will result in the temporary suspension and deposition of sediments, flow pattern alteration, and tow propeller wash, as well. Within the intake channel proper, these indirect effects are expected to occur over an estimated 156,000 ft^2 (14,493 m^2), and affect an estimated 2 pink muckets. Within the overbank portion, indirect effects are expected to occur over an estimated 456,200 ft^2 (42,382 m^2) and affect an estimated 34 pink muckets. Dredging will occur every 5 to 10 years, and it is unlikely that pink muckets will re-colonize the intake channel and overbank areas between these maintenance dredging activities.

For the AP1000 alternative, the barge terminal area will be dredged one-time only. Approximately 15,000 ft^2 (1,394 m^2) will be dredged, which may result in the direct killing or harm of one pink mucket. Indirect effects from the dredging will be similar to those described above for the intake channel. In addition, the pink mucket could be impacted by tow propeller wash caused by the barges that will need to be used for both the B&W and AP1000 construction alternatives. The indirect effects associated with tow propeller wash include extreme turbulence, increased suspended sediments, scouring of substrate, and accumulation of fine sediment in surrounding areas. An estimated 86,250 ft^2 (8,013 m^2) will be affected, which in turn will affect 7 pink muckets.

The thermal and chemical mixing zone (i.e., the limits of where thermal and chemical effects from the diffuser would be felt) encompasses a 250-ft (76 m) radius from the diffuser in all directions for both the B&W and AP1000 alternatives. According to the CORMIX modeling provided in Appendix A of the Biological Assessment, live mussels on the river bottom will not be directly impacted by the coolant water effluent within the mixing zone. However, indirectly these mussels may be unable to reproduce successfully due to the stressing of host fish that pass through the mixing zone, the inability of mussel larvae to attach, or remain attached to host fish in the mixing zone or affected by the mixing zone, death or disabling of larvae attached to host fish that past through the mixing zone, etc. An unknown number of larvae and an estimated 20 adult pink muckets may be harmed within the 269,000 ft^2 (20,242 m^2) area associated with the mixing zone.

Table 3. Types and amount of take for the proposed action.

Impact Area/Action	**Type of Take**	**Area (ft^2/m^2)**	**Total mussel density[a] (no/m^2)/Total mussels**	**No. of adult/juvenile pink mucket taken[b]**
Intake Channel/ Dredging – Direct (B&W and AP1000)	Harm and Kill	240,000/22,297	2,676	3
Intake Channel/Dredging – Indirect (B&W and AP1000)	Harm	156,000/14,493	1,739	2
Overbank/Dredging – Direct (B&W)	Harm and Kill	19,000/1,765	1,430	2
Overbank/Dredging-Indirect (B&W)	Harm	456,200/42,382	34,329	34
Barge Terminal/Dredging – Direct (AP1000)	Harm and Kill	15,000/1,394	1,129	1
Barge Terminal/Dredging and Barge Use – Indirect (B&W and AP1000)	Harm	86,250/8,013	6,491	7
Effluent Mixing Zone (B&W and AP1000)[b]	Harm	269,000/24,900	20,242	20

[a]Densities based on Dinkins (2009) with a 3X multiplier correction factor to account for sampling type error (surface searches).
[b]The number of larvae that may be affected by the Effluent Mixing Zone is unknown.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the pink mucket or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of the pink mucket.

1. Reduce the area and amount of sediment deposition downstream of the dredging activities.

2. Work with the Service, State fish and wildlife agencies, and non-governmental groups to promote recovery of the pink mucket and other listed mussel species from the Tennessee/Cumberland River basins.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, TVA must comply with the following terms and conditions, which carry out the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Implement Best Management Practices (BMPs) during the proposed dredging activities.

2. To the maximum extent possible, TVA should restrict all dredging activities to periods during low river discharges when the potential for downstream movement of dredged and suspended material is reduced.

3. As per the commitment made in TVA's March 18, 2010, letter to the Service's Alabama Field Office, and follow-up meeting on April 1, 2010, TVA will provide $30,000 to the Alabama Department of Conservation and Natural Resources' Alabama Aquatic Biodiversity Center (AABC) for the reintroduction and/or augmentation of pink mucket and other high priority mollusks within their historic ranges. The reintroduction/augmentation project will be funded by TVA prior to the initiation of dredging activities associated with the construction and operation of a single nuclear unit at the BLN site.

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office (Special Agent Donnie Grace, 1208-B Main Street, Daphne, AL 36526 (251/441-5787). Additional notification must be made to the Fish and Wildlife Service Ecological Services

Field Office (251/441-5181). Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than 68 adult/juvenile and an unknown number of larval-stage pink mucket will be incidentally taken if the B&W alternative is chosen, and that no more than 33 adult/juvenile and an unknown number of larvae will be taken if the AP1000 alternative is chosen. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. TVA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

- Continue to work with the Service and other partners in modifying dam discharges to improve habitat conditions in tailwaters for the pink mucket and other endangered and threatened mollusks.
- Determine the status of pink mucket populations in areas impacted by TVA actions on the Tennessee River through periodic monitoring that includes a quantitative component that provides basic population size estimates and a sampling design specifically for searching for juveniles, thus facilitating the assessment of recruitment into a population.
- Conduct studies to determine if hydraulic or other factors associated with TVA's operations can affect pink mucket patchiness and rareness in large river habitats and conduct threat assessments from particular stressors.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the November 4, 2009, request. As written in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary TVA involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the TVA action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the TVA action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease until reinitiation.

For this biological opinion the incidental take would be exceeded when the take exceeds 68 pink muckets for the B&W alternative or 33 pink muckets for the AP1000 alternative, which is what has been exempted from the prohibitions of section 9 by this opinion. The Service appreciates the cooperation of TVA during this consultation. We would like to continue working with you and your staff regarding the Bellefonte Nuclear Plant project. For further coordination please contact Karen Marlowe at (205) 726-2667.

Sincerely,

William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office

cc: Bob Butler, USFWS, Ecological Services, Asheville, NC
USFWS, Ecological Services, Cookeville, TN
ADCNR, Montgomery, AL
GSA, Tuscaloosa, AL

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State Historic Preservation Officer Consultation (Alabama, Georgia, and Tennessee)

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Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

August 25, 2009

Ms. Stacye Hathorn
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Hathorn:

TVA, BELLEFONTE NUCLEAR PLANT COMPLETION OF ONE UNIT, JACKSON COUNTY, ALABAMA

The Tennessee Valley Authority (TVA) previously consulted with your office regarding the construction of two new reactor units at the Bellefonte Nuclear Plant site in Jackson County, Alabama (BLN) (NuStart Combined Operating License Application for Units 3 and 4; AHC 2006-1211). TVA is now preparing a Supplemental Environmental Impact Statement (SEIS) that will update existing information about the potential environmental impacts associated with its proposal to operate a single nuclear unit on the same site. The SEIS will evaluate three alternatives – completing and operating one of the partially completed units, constructing and operating a new Westinghouse AP1000 nuclear unit, and taking no action to operate a nuclear unit at the site.

TVA originally applied for a license for the construction and operation of two Babcock & Wilcox pressurized water reactors, BLN Units 1 and 2 in 1974. In 1988, TVA formally notified the Nuclear Regulatory Commission of construction deferral and at that time, Unit 1 was approximately 90 percent complete and Unit 2 was approximately 58 percent complete. The plant was maintained in deferred status until 2005. Since then, several buildings have been removed.

TVA has determined the area of potential effects (APE) for the construction of a single unit to be the approximate 606 acres surrounding the proposed construction and its associated infrastructure as well as a 1-mile viewshed for historic structures. Due to the similarity of areas needed for construction and operational purposes, this same APE was earlier considered and coordinated with the Alabama State Historic Preservation Office (AL SHPO) regarding Units 3 & 4.

Two surveys were conducted within the APE to identify archaeological sites or historic structures that may be impacted by the construction of Units 3 & 4 (Deter-Wolfe 2007 and Jenkins 2008). Results of the archaeological survey concluded that sites 1JA300 and 1JA301 were completely destroyed by the intake construction. Site 1JA113 was determined, in consultation with AL SHPO and federally recognized Indian tribes to be ineligible for listing in the National Register of Historic Places (NRHP) along with one newly recorded historic archaeological site (1JA1103). Site 1JA111 was recommended

Ms. Stacye Hathorn
Page 2
August 25, 2009

as potentially eligible for listing in NRHP. TVA has committed to fence off and mark 1JA111 on the BLN site drawings to avoid impacts by any future planned construction. Any future modification to current project plans which have a potential to affect this site, would require TVA to conduct further testing of 1JA111 to determine its NRHP eligibility status.

Two historic sites (Bellefonte Cemetery and the African American Bellefonte Cemetery) were identified in the visual APE that was determined to meet the criteria of eligibility for the NRHP. It was determined by TVA, in consultation with your office, that these eligible resources were protected by existing dense vegetative buffers and will not be adversely affected by any new construction at the Bellefonte Plant site.

TVA is providing a copy of this report to the Eastern Band of Cherokee Indians, United Keetoowah Band, Cherokee Nation, The Chickasaw Nation, Muscogee (Creek) Nation of Oklahoma, Thlopthlocco Tribal Town, Kialegee Tribal Town, Alabama-Quassarte Tribal Town, Alabama-Coushatta Tribe of Texas, Eastern Shawnee Tribe of Oklahoma, Shawnee Tribe, Absentee Shawnee Tribe of Oklahoma, Seminole Tribe of Florida, Jena Band of Choctaw Indians, the Poarch Band of Creek Indians, and the Choctaw Nation of Oklahoma and requesting their comments on our findings.

Based on these findings and the commitment to protect site 1JA111, TVA has determined that the proposed undertaking will have no effect on historic properties. Pursuant to Section 106 of the *National Historic Preservation Act* and its implementing regulations at 36 CFR § 800, TVA is seeking your concurrence with this determination.

If you have any questions or comments, please contact me or Erin Pritchard at eepritchard@tva.gov or 865-632-2463.

Sincerely,

Eric Howard

A. Eric Howard
Manager (Interim)
Cultural Resources

EEP:IKS
cc: Ruth Horton, WT 11D-K
Bruce Yeager, WT 11D-K
EDMS, WT 11D-K

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

September 9, 2009

Eric Howard
TVA
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Re: AHC 06-1211
Unit One Bellefonte Nuclear Plant
Jackson County, Alabama

Dear Mr. Howard:

Upon review of the information forwarded by your office, we have determined that we agree with your findings. We agree with the proposals to avoid archaeological site 1Ja111 as it is potentially eligible for the National Register of Historic Places (NRHP). We further agree that should future modifications to the development plan include an impact to this site, Phase II testing proposals will have to be developed and carried out in consultation with our office. Finally, we agree that the two NRHP eligible cemeteries will not be adversely affected by the proposed activities due to the existing dense vegetation buffers.

We appreciate your efforts on this project. Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/GCR/gcr

THE STATE HISTORIC PRESERVATION OFFICE
www.preserveala.org

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

September 9, 2009

Ms. Stacye Hathorn
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Hathorn:

TVA, BELLEFONTE NUCLEAR TRANSMISSION LINE UPGRADES: LIMESTONE, JACKSON, AND MORGAN COUNTIES, ALABAMA; BEDFORD, COFFEE, SEQUATCHIE, HAMILTON, AND MARION COUNTIES, TENNESSEE, AND WALKER AND DADE COUNTIES, GEORGIA

By this letter, the Tennessee Valley Authority (TVA) is initiating consultation for the proposed upgrading of TVA transmission lines (TL) and TL right-of-ways (ROWs) associated with the Bellefonte Nuclear Plan Completion Project (PROJECT). TVA is in the planning stages of the PROJECT and the proposed upgrading of the TLs would begin around 2016.

Currently, TVA is in the process of preparing a Supplemental Environmental Impact Statement that would update existing information about the potential environmental impacts associated with its proposal to operate a single nuclear generation unit at the Bellefonte Nuclear Plant (BLN) site. TVA may choose to 1) complete and operate either one of two partially constructed units (Babcock and Wilcox pressurized water reactor) or 2) construct and operate one new technology unit (Westinghouse AP1000 advanced boiling water reactor). The No Action Alternative would also be considered.

As currently proposed under both Action Alternatives, the existing 161-kilovolt (kV) and 500-kV switchyards constructed on the BLN site would be refurbished and reenergized; four 500-kV TL that terminate in the BLN switchyard would be reestablished; the ROW would be brought back to current TVA standards; the capacity of nine existing TLs would be increased; and two 161-kV transmission lines that supply a 161-kV switchyard to provide site power would be reestablished (Figure 1); all of these TLs and ROWs are existing.

TVA has determined the area of potential effects (APE) to be the ROW and TLs that are slated for upgrades and the footprint of all infrastructures (e.g., access roads, staging areas). The architectural APE would be a .5-mile wide area linearly centered along the proposed TL ROW.

A review of the Alabama, Tennessee, and Georgia site files identified twenty-five sites have been previously recorded within the APE. One of these sites (1MG785) is no longer extant. Seven sites (1MG116, 1MG115, 1MG667, 1MG758, 1MG757, 1JA304, 1JA694) were previously determined not eligible for the National Record of Historical Places (NRHP). Two sites, 1MG735 and 9WA164, have been previously determined potentially eligible for the NRHP. The remaining 15 sites (1JA637, 1JA650, 40MI246, 40MI247, 40HA0089, 40MI248, 1JA453, 1JA452, 1JA304, 1JA377, 1JA518, 1JA532, 1JA524, 1JA617, and 1JA558) have not been assessed for NRHP eligibility. In Alabama, one previously recorded historic district (the City of

Ms. Stacye Hathorn
Page 2
September 9, 2009

Bridgeport) falls within the architectural APE. In Georgia, one eligible Historic District (Happy Valley Farms in Walker County, Georgia) and two eligible historic structures (WA-WA-114 and WA-WA-642) falls within the .5 mile architectural APE. All of these properties and other yet-to-be-identified properties would be assessed in consultation with your office and other interested parties.

At this time TVA is simply providing notification of the proposed undertaking. By 2014, TVA cultural resources would consult with your offices regarding the Scope of Work for the evaluation and identification of any cultural resources that would be affected by the proposed undertaking.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,

Eric Howard

A. Eric Howard
Manager (Interim)
Cultural Resources

MH:IKS
Enclosure
cc: EDMS, WT 11D-K

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

September 9, 2009

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
Clover Bottom Mansion
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TVA, BELLEFONTE NUCLEAR TRANSMISSION LINE UPGRADES: LIMESTONE, JACKSON, AND MORGAN COUNTIES, ALABAMA; BEDFORD, COFFEE, SEQUATCHIE, HAMILTON, AND MARION COUNTIES, TENNESSEE, AND WALKER AND DADE COUNTIES, GEORGIA

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As currently proposed under both Action Alternatives, the existing 161-kilovolt (kV) and 500-kV switchyards constructed on the BLN site would be refurbished and reenergized; four 500-kV TL that terminate in the BLN switchyard would be reestablished; the ROW would be brought back to current TVA standards; the capacity of nine existing TLs would be increased; and two 161-kV transmission lines that supply a 161-kV switchyard to provide site power would be reestablished (Figure 1); all of these TLs and ROWs are existing.

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Mr. E. Patrick McIntyre, Jr.
Page 2
September 9, 2009

1JA452, 1JA304, 1JA377, 1JA518, 1JA532, 1JA524, 1JA617, 1JA558) have not been assessed for NRHP eligibility. In Alabama, one previously recorded historic district (the City of Bridgeport) falls within the architectural APE. In Georgia, one eligible Historic District (Happy Valley Farms in Walker County, Georgia) and two eligible historic structures (WA-WA-114 and WA-WA-642) falls within the .5-mile architectural APE. All of these properties and other yet-to-be-identified properties would be assessed in consultation with your office and other interested parties.

At this time, TVA is simply providing notification of the proposed undertaking. By 2014, TVA cultural resources would consult with your offices regarding the Scope of Work for the evaluation and identification of any cultural resources that would be affected by the proposed undertaking.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,

Eric Howard

A. Eric Howard
Manager (Interim)
Cultural Resources

MH:IKS
Enclosure
cc: EDMS, WT 11D-K

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

September 10, 2009

Mr. Ray Luce
State Historic Preservation Officer
34 Peachtree Street, NW, Suite 1600
Atlanta, Georgia 30303-2316

Dear Mr. Luce:

TVA, BELLEFONTE NUCLEAR TRANSMISSION LINE UPGRADES: LIMESTONE, JACKSON, AND MORGAN COUNTIES, ALABAMA; BEDFORD, COFFEE, SEQUATCHIE, HAMILTON, AND MARION COUNTIES, TENNESSEE, AND WALKER AND DADE COUNTIES, GEORGIA

By this letter, the Tennessee Valley Authority (TVA) is initiating consultation for the proposed upgrading of TVA transmission lines (TL) and TL right-of-ways (ROW) associated with the Bellefonte Nuclear Plan Completion Project (PROJECT). TVA is in the planning stages of the PROJECT and the proposed upgrading of the TLs would begin around 2016.

Currently, TVA is in the process of preparing a Supplemental Environmental Impact Statement that would update existing information about the potential environmental impacts associated with its proposal to operate a single nuclear generation unit at the Bellefonte Nuclear Plant (BLN) site. TVA may choose to 1) complete and operate either one of two partially constructed units (Babcock and Wilcox pressurized water reactor) or 2) construct and operate one new technology unit (Westinghouse AP1000 advanced boiling water reactor). The No Action Alternative would also be considered.

As currently proposed under both Action Alternatives, the existing 161-kilovolt (kV) and 500-kV switchyards constructed on the BLN site would be refurbished and reenergized; four 500-kV TL that terminate in the BLN switchyard would be reestablished; the ROW would be brought back to current TVA standards; the capacity of nine existing TLs would be increased; and two 161-kV transmission lines that supply a 161-kV switchyard to provide site power would be reestablished (Figure 1); all of these TLs and ROWs are existing.

TVA has determined the area of potential effects (APE) to be the ROW and TLs that are slated for upgrades and the footprint of all infrastructures (e.g., access roads, staging areas). The architectural APE would be a .5 mile wide area linearly centered along the proposed TL ROW.

A review of the Alabama, Tennessee, and Georgia site files identified twenty-five sites have been previously recorded within the APE. One of these sites (1MG785) is no longer extant. Seven sites (1MG116, 1MG115, 1MG667, 1MG758, 1MG757, 1JA304, 1JA694) were previously determined not eligible for the National Register of Historical Places (NRHP). Two sites, 1MG735 and 9WA164, have been previously determined potentially eligible for the NRHP. The remaining 15 sites (1JA637, 1JA650, 40MI246, 40MI247, 40HA0089, 40MI248, 1JA453, 1JA452, 1JA304, 1JA377, 1JA518, 1JA532, 1JA524, 1JA617, 1JA558) have not been assessed for NRHP eligibility. In Alabama, one previously recorded historic district (the City of Bridgeport)

Mr. Ray Luce
Page 2
September 10, 2009

falls within the architectural APE. In Georgia, one eligible Historic District (Happy Valley Farms in Walker County, Georgia) and two eligible historic structures (WA-WA-114 and WA-WA-642) falls within the .5 mile architectural APE. All of these properties and other yet-to-be-identified properties would be assessed in consultation with your office and other interested parties.

At this time, TVA is simply providing notification of the proposed undertaking. By 2014, TVA Cultural Resources would consult with your offices regarding the Scope of Work for the evaluation and identification of any cultural resources that would be affected by the proposed undertaking.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,

Eric Howard

A. Eric Howard
Manager (Interim)
Cultural Resources

MH:IKS
Enclosure
cc: EDMS, WT 11D-K

ALABAMA-COUSHATTA TRIBE OF TEXAS
571 State Park Rd 56 • Livingston, Texas 77351 • (936) 563-1100

September 18, 2009

Tennessee Valley Authority
Attn: Pat Bernard Ezzell
400 West Summit Hill Drive
Knoxville, TN 37902-1499

Dear Mrs. Ezzell:

On behalf of Chief Oscola Clayton Sylestine and the Alabama-Coushatta Tribe, our appreciation is expressed on your efforts to consult us regarding the Bellefonte Nuclear Plant proposal in Jackson County.

Our Tribe maintains ancestral associations within the state of Mississippi despite the absence of written records to completely identify Tribal activities, villages, trails, or grave sites. However, it is our objective to ensure significances of Native American ancestry including the Alabama-Coushatta Tribe are administered with the utmost regard.

Upon review of your August 26, 2009 documents submitted to our office, no known impacts to religious, cultural, or historical assets of the Alabama-Coushatta Tribe of Texas should occur in conjunction with this activity. Based upon the provisions to be incorporated during implementation, we have no objections to the proceeding of this proposal.

In the event of inadvertent discovery of human remains and/or archaeological artifacts, activity in proximity to the location must cease and appropriate authorities, including this office, notified without delay. Should you require additional assistance, please do not hesitate to contact us.

Respectfully submitted,

Bryant J. Celestine
Historic Preservation Officer

Telephone: 936 – 563 – 1181 celestine.bryant@actribe.org Fax: 936 – 563 – 1183

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

September 25, 2009

A. Eric Howard
TVA
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Re: AHC 09-1092
Transmission Line Upgrades
Bellefonte Nuclear Facility
Multiple Counties, Alabama

Dear Mr. Howard:

Thank you for forwarding the information regarding the development of a Supplemental Environmental Impact Statement for the above referenced project. We look forward to working with you as this process proceeds.

Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Sincerely,

Frank White
State Historic Preservation Officer

FW/LAW/AMH/gcr

THE STATE HISTORIC PRESERVATION OFFICE
www.preserveala.org

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

October 28, 2009

Ms. Stacye Hathorn
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Hathorn:

AHC 09-1092 TRANSMISSION LINE (TL) UPGRADES BELLEFONTE NUCLEAR FACILITY MULTIPLE COUNTIES, ALABAMA

In a letter dated September 9, 2009, TVA initiated consultation regarding the proposed upgrading of TVA TLs and right-of-ways (ROWs) which would result from the Bellefonte Nuclear Plant Completion Project (Project). Following further review, TVA finds that in order to proceed with Project planning an agreement document developed in consultation with your office and other interested parties would be required. This document would facilitate the phased identification and evaluation of historic properties that may be affected by the proposed TL and ROW upgrades planned in 2016. Therefore, TVA's Archeological and Historic staff are in the process of drafting an agreement document for your review and comment and will submit this document to you in the forthcoming month.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer
WT 11D-K

MH:IKS
cc: EDMS, WT 11D-K

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

October 28, 2009

Mr. Ray Luce
State Historic Preservation Officer
Department of Natural Resources
34 Peachtree Street, NW, Suite 1600
Atlanta, Georgia 30303-2316

Dear Mr. Luce:

TENNESSEE VALLEY AUTHORITY (TVA), BELLEFONTE NUCLEAR PLANT, PROPOSED UPGRADES TO TVA TRANSMISSION LINES (TL), DADE AND WALKER COUNTIES, GEORGIA HP-090914-01

In a letter dated September 9, 2009, TVA initiated consultation regarding the proposed upgrading of TVA TLs and right-of-ways (ROWs) which would result from the Bellefonte Nuclear Plant Completion Project (Project). Following further review, TVA finds that in order to proceed with Project planning an agreement document developed in consultation with your office and other interested parties would be required. This document would facilitate the phased identification and evaluation of historic properties that may be affected by the proposed TL and ROW upgrades planned in 2016. Therefore, TVA's Archeological and Historic staff are in the process of drafting an agreement document for your review and comment and will submit this document to you in the forthcoming month.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer
WT 11D-K

MH:IKS
cc: EDMS, WT 11D-K

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

October 28, 2009

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
Clover Bottom Mansion
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNEESSEE VALLEY AUTHORITY (TVA), BELLEFONTE NUCLEAR TRANSMISSION LINE (TL) UPGRADES, LIMESTONE, JACKSON, AND MORGAN COUNTIES, ALABAMA; BEDFORD, COFFEE, SEQUATCHIE, HAMILTON, AND MARION COUNTIES, TENNESSEE; AND WALKER AND DADE COUNTIES, GEORGIA

In a letter dated September 9, 2009, TVA initiated consultation regarding the proposed upgrading of TVA TLs and right-of-ways (ROWs) which would result from the Bellefonte Nuclear Plant Completion Project (Project). Following further review, TVA finds that in order to proceed with Project planning an agreement document developed in consultation with your office and other interested parties would be required. This document would facilitate the phased identification and evaluation of historic properties that may be affected by the proposed TL and ROW upgrades planned in 2016. Therefore, TVA's Archeological and Historic staff are in the process of drafting an agreement document for your review and comment and will submit this document to you in the forthcoming month.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer
WT 11D-K

MH:IKS
cc: EDMS, WT 11D-K

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

November 4, 2009

Mr. Frank White
State Historic Preservation Officer
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Mr. White:

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS) FOR A SINGLE NUCLEAR UNIT AT THE BELLEFONTE SITE AND ASSOCIATED TRANSMISSION UPGRADES IN JACKSON COUNTY, LIMESTONE COUNTY, AND MORGAN COUNTY, ALABAMA

Please find enclosed two copies of the draft SEIS, which evaluates Tennessee Valley Authority's (TVA) proposal to complete or construct and operate a single nuclear generating unit at the Bellefonte Nuclear Plant (BLN) site located in Jackson County, Alabama. TVA is requesting your review of the draft SEIS and is accepting comments between November 13 and December 28, 2009.

TVA is considering a No Action Alternative and two Action Alternatives: completion and operation of a Babcock and Wilcox pressurized light water reactor or construction and operation of a Westinghouse AP1000 advanced pressurized light water reactor. Either of the two Action Alternatives would use licensing processes that are already underway. The draft SEIS also evaluates the impact of refurbishing, reenergizing, and upgrading existing electrical transmission infrastructure necessary to accommodate new power generation.

TVA has identified the need for additional base load generation in the 2018 to 2020 time frame. Completion or construction of one additional nuclear unit capable of generating between approximately 1,100 and 1,200 megawatt (MW) of power within this time frame would help address the need for additional base load generation in the TVA power service area and help meet TVA's goal to have at least 50 percent of its generation portfolio comprised of low or zero carbon-emitting sources by the year 2020. Both Action Alternatives proposed would also make beneficial use of existing assets at the BLN site.

This draft SEIS supplements TVA's original 1974 *Final Environmental Statement – Bellefonte Nuclear Plant Units 1 and 2* for the BLN project and updates other related environmental documents including a 2008 environmental report for the AP1000 for BLN Units 3 and 4. TVA will identify its preferred alternative in the final SEIS after receiving input from the reviewing agencies and the public.

The draft SEIS may be viewed at www.tva.gov/environment/reports/blnp, and comments may be provided to us online. Please note that any comments received, including names and addresses, will become part of the administrative record and will be available for public inspection. To provide written comments or request a printed copy of the draft SEIS, please contact:

Ruth M. Horton
Senior NEPA Specialist
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, Tennessee 37902

Phone: (865) 632-3719
E-mail: rmhorton@tva.gov

Also, for general project information, contact:

Andrea L. Sterdis
Nuclear Project Manager
Tennessee Valley Authority
1101 Market Street, LP 5A
Chattanooga, Tennessee 37402

Phone: (423) 751-7119
E-mail: alsterdis@tva.gov

Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer
Office of Environment and Research
WT 11D-K

Enclosure

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

November 4, 2009

Mr. Ray Luce
State Historic Preservation Officer
34 Peachtree Street, NW, Suite 1600
Atlanta, Georgia 30303-2316

Dear Mr. Luce:

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS) FOR A SINGLE NUCLEAR UNIT AT THE BELLEFONTE SITE AND ASSOCIATED TRANSMISSION UPGRADES IN DADE COUNTY AND WALKER COUNTY, GEORGIA

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E-mail: alsterdis@tva.gov

Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer
Office of Environment and Research
WT 11D-K

Enclosure

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

November 4, 2009

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Pike
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS) FOR A SINGLE NUCLEAR UNIT AT THE BELLEFONTE SITE AND ASSOCIATED TRANSMISSION UPGRADES IN BEDFORD COUNTY, COFFEE COUNTY, HAMILTON COUNTY, MARION COUNTY, AND SEQUATCHIE COUNTY, TENNESSEE

Please find enclosed two copies of the draft SEIS, which evaluates Tennessee Valley Authority's (TVA) proposal to complete or construct and operate a single nuclear generating unit at the Bellefonte Nuclear Plant (BLN) site located in Jackson County, Alabama. TVA is requesting your review of the draft SEIS and is accepting comments between November 13 and December 28, 2009.

TVA is considering a No Action Alternative and two Action Alternatives: completion and operation of a Babcock and Wilcox pressurized light water reactor or construction and operation of a Westinghouse AP1000 advanced pressurized light water reactor. Either of the two Action Alternatives would use licensing processes that are already underway. The draft SEIS also evaluates the impact of refurbishing, reenergizing, and upgrading existing electrical transmission infrastructure necessary to accommodate new power generation.

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Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer
Office of Environment and Research
WT 11D-K

Enclosure

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

March 24, 2010

To Those Listed:

TVA, BELLEFONTE NUCLEAR TRANSMISSION LINE UPGRADES, LIMESTONE, JACKSON, AND MORGAN COUNTIES, ALABAMA; BEDFORD, COFFEE, SEQUATCHIE, HAMILTON, AND MARION COUNTIES, TENNESSEE; AND WALKER AND DADE COUNTIES, GEORGIA

TVA previously consulted with you on August 26, 2009, regarding the Bellefonte Nuclear Completion Project. By this letter, the Tennessee Valley Authority (TVA) is providing preliminary documentation for the proposed upgrading of TVA transmission lines (TLs) and TL right-of-ways (ROW) associated with the Bellefonte Nuclear Plant Completion Project (PROJECT). TVA is in the planning stages of the PROJECT and the proposed upgrading of the TLs would begin around 2016.

Currently, TVA is in the process of preparing a Supplemental Environmental Impact Statement that would update existing information about the potential environmental impacts associated with its proposal to operate a single nuclear generation unit at the Bellefonte Nuclear Plant (BLN) site. TVA may choose to 1) complete and operate either one of two partially constructed units (Babcock and Wilcox pressurized water reactor) or 2) construct and operate one new technology unit (Westinghouse AP1000 advanced boiling water reactor). The No Action Alternative would also be considered.

As currently proposed under both Action Alternatives, the existing 161-kilovolt (kV) and 500-kV switchyards constructed on the BLN site would be refurbished and reenergized; four 500-kV TL that terminate in the BLN switchyard would be reestablished; the ROW would be brought back to current TVA standards; the capacity of nine existing TLs would be increased; and two 161-kV transmission lines that supply a 161-kV switchyard to provide site power would be reestablished (Figure 1); all of these TLs and ROWs are existing.

TVA has determined the area of potential effects (APE) to be the ROW and TLs that are slated for upgrades and the footprint of all infrastructures (e.g., access roads, staging areas). The architectural APE would be a .5 mile wide area linearly centered along the proposed TL ROW.

A review of the Alabama, Tennessee, and Georgia site files identified twenty-five sites previously recorded within the APE. One of these sites (1MG785) is no longer extant. Seven sites (1MG116, 1MG115, 1MG667, 1MG758, 1MG757, 1JA304, 1JA694) were previously determined not eligible for the National Register of Historic Places (NRHP). Two sites, 1MG735 and 9WA164, has been previously determined potentially eligible for the NRHP. The remaining 15 sites (1JA637, 1JA650, 40MI246, 40MI247, 40HA0089, 40MI248, 1JA453, 1JA452, 1JA304, 1JA377, 1JA518, 1JA532, 1JA524, 1JA617, 1JA558) have not been assessed for NRHP eligibility. In Alabama, one previously recorded historic district (the City of Bridgeport) falls within the architectural APE. TVA would seek comments regarding these properties and other yet to be identified properties.

Page 2
March 24, 2010

TVA is preparing three Memoranda of Agreement (MOA) for the phased identification and evaluation of cultural resources within the APE. Because three states are involved in the APE, a separate MOA for phased identification and evaluation will be executed between TVA and each State Historic Preservation Officer (Alabama, Tennessee, and Georgia).

At this time TVA is providing notification of the proposed undertaking to the following tribes: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, The Chickasaw Nation, Muscogee (Creek) Nation of Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Kialegee Tribal Town, Thlopthlocco Tribal Town, Seminole Tribe of Florida, Absentee-Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Shawnee Tribe, Jena Band of Choctaw Indians, and the Poarch Band of Creek Indians. No upgrading or reconductoring for the proposed undertaking is scheduled to begin until 2016.

At this time, TVA is inviting you to participate as a concurring party to the MOA for a phased identification and evaluation of historic properties. Please let me know if you would like to participate as a concurring party; and, if so, for which states. Whether you choose to be a concurring party to this agreement document or not, TVA will consult with you regarding any National Register of Historic Places eligibility evaluations, determinations, and/or historic property treatment plans, should such measures be required.

Should you have any questions, please contact me via phone at 865/632-6461 or via e-mail at pbezzell@tva.gov. Please respond within 30 days of receipt of this letter, if you have any comments on the proposed undertaking.

Sincerely,

Pat Bernard Ezzell

Pat Bernard Ezzell
Native American Liaison and Historian

MH:PBE:IKS
Enclosure
cc: Kimberly Hodges (EDMS), LP 2V-C

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

April 8, 2010

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
Clover Bottom Mansion
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

MEMORANDUM OF AGREEMENT BETWEEN THE TENNESSEE VALLEY AUTHORITY AND THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER FOR THE TRANSMISSION LINE UPGRADES RELATING TO THE BELLEFONTE NUCLEAR PROJECT

Enclosed for your signature, is one copy of the Memorandum of Agreement (MOA) and three additional signatory pages regarding the proposed Bellefonte Nuclear Project transmission line (TL) upgrades. TVA has consulted with your office and other consulting parties during the development of the MOA. The MOA was prepared for the Bellefonte Nuclear Project Supplemental Environmental Impacts Statement. The MOA is for the phased identification and evaluation of historic properties that may be affected by the proposed TL upgrades to begin in 2016.

Please sign the three additional enclosed signatory pages and return to me. If you have questions, please feel free to contact me at (865) 632-2457.

Sincerely,

Eric Howard

A. Eric Howard
Federal Preservation Officer

MH:IKS
Enclosures
cc: Files, HAPC, WT 11D-K

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION

CHRIS CLARK
COMMISSIONER

DR. DAVID CRASS
DIVISION DIRECTOR

April 29, 2010

Mr. A. Eric Howard
Federal Preservation Officer
Historic and Archaeological Permitting and Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Re: Memorandum of Agreement
Upgrade Belfonte Nuclear Transmission lines
Dade and Walker Counties, Georgia
HP-090914-001

Dear Mr. Howard:

The Historic Preservation Division (HPD) has received the Memorandum of Agreement (MOA) for the above referenced project in Dade and Walker Counties, Georgia. Our comments are offered to assist federal agencies in complying with the provisions of Section 106 of the National Historic Preservation Act of 1966, as amended.

As previously stated, HPD concurs that the MOA is adequate to address adverse effects that may be associated with undertaking. Therefore, I have signed this agreement and am returning three (3) additional original signature pages to you for further processing.

If you have any questions, please contact Elizabeth (Betsy) Shirk, Environmental Review Coordinator, at (404) 651-6624.

Sincerely,

Dave Crass

Dr. David Crass
Division Director
Deputy State Historic Preservation Officer

DC/ECS

Enclosure

cc: Richard Yarnell, TVA, wryarnell@tva.gov
Dan Latham, Jr., Northwest Georgia RC
PA File

254 WASHINGTON STREET, SW | GROUND LEVEL | ATLANTA, GEORGIA 30334
404.656.2840 | FAX 404.657.1368 | WWW.GASHPO.ORG

APPENDIX I – BLN METEOROLOGICAL TOWER DATA, APRIL 1, 2006, TO SEPTEMBER 24, 2008

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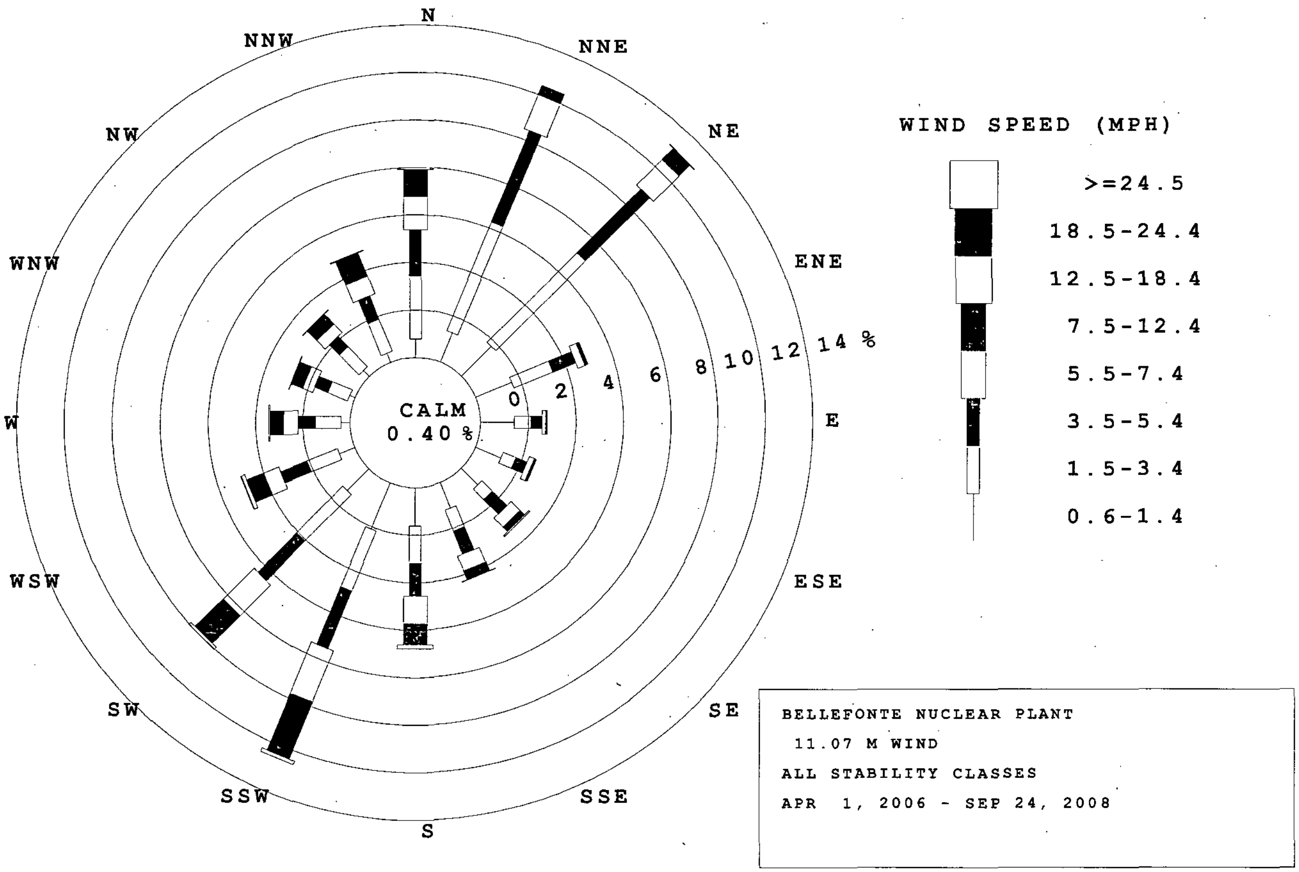
Bellefonte Nuclear Plant
Meteorological Tower Data
(04/01/2006-09/24/2008)

Composite Wind Rose
(All Stability Classes)



Bellefonte Nuclear Plant
Meteorological Tower Data
(04/01/2006-09/24/2008)

Occurrence of Stability Classes

Stability Class	Percent of Total Hours
A	0.915
B	1.985
C	4.725
D	44.107
E	27.465
F	11.917
G	8.886

Wind Direction Distribution

Wind Direction (blowing from)	Percent of Total Hours
N	7.944
NNE	12.454
NE	13.147
ENE	4.908
E	2.812
ESE	2.568
SE	3.328
SSE	4.240
S	6.802
SSW	12.547
SW	10.029
WSW	4.944
W	3.459
WNW	2.757
NW	3.242
NNW	4.819

Wind Speed Distribution

Wind Speed Class (mph)	Percent of Total Hours
Calm (<0.6)	0.397
0.6-1.4	17.334
1.5-3.4	30.630
3.5-5.4	24.271
5.5-7.4	14.767
7.5-12.4	11.755
12.5-18.4	0.827
18.5-24.4	0.019
24.5+	0.000

Bellefonte Nuclear Plant
Meteorological Tower Data
(04/01/2006-09/24/2008)

Joint Frequency Distributions by Stability Class

Stability Class A

WIND DIRECTION	WIND SPEED (MPH) CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.005
NNE	0.000	0.000	0.000	0.000	0.015	0.010	0.000	0.000	0.000	0.024
NE	0.000	0.000	0.005	0.005	0.010	0.015	0.000	0.000	0.000	0.034
ENE	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
E	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.005
ESE	0.000	0.000	0.000	0.010	0.010	0.005	0.000	0.000	0.000	0.024
SE	0.000	0.000	0.000	0.000	0.039	0.010	0.005	0.000	0.000	0.054
SSE	0.000	0.000	0.000	0.005	0.049	0.019	0.000	0.000	0.000	0.073
S	0.000	0.000	0.000	0.019	0.073	0.049	0.000	0.000	0.000	0.141
SSW	0.000	0.005	0.000	0.005	0.015	0.058	0.000	0.000	0.000	0.083
SW	0.000	0.000	0.000	0.029	0.029	0.073	0.005	0.000	0.000	0.136
WSW	0.000	0.000	0.000	0.000	0.005	0.049	0.005	0.000	0.000	0.058
W	0.000	0.000	0.000	0.000	0.029	0.044	0.010	0.000	0.000	0.083
WNW	0.000	0.000	0.010	0.005	0.024	0.015	0.000	0.000	0.000	0.054
NW	0.000	0.000	0.010	0.000	0.015	0.015	0.000	0.000	0.000	0.039
NNW	0.000	0.000	0.005	0.000	0.019	0.068	0.000	0.000	0.000	0.092
SUBTOTAL	0.000	0.005	0.044	0.078	0.336	0.428	0.024	0.000	0.000	0.915

Stability Class B

WIND DIRECTION	WIND SPEED (MPH) CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.000	0.000	0.024	0.068	0.083	0.000	0.000	0.000	0.175
NNE	0.000	0.000	0.005	0.000	0.054	0.015	0.000	0.000	0.000	0.073
NE	0.000	0.000	0.000	0.005	0.039	0.044	0.000	0.000	0.000	0.088
ENE	0.000	0.000	0.005	0.000	0.010	0.010	0.000	0.000	0.000	0.024
E	0.000	0.000	0.000	0.000	0.010	0.005	0.000	0.000	0.000	0.015
ESE	0.000	0.000	0.000	0.000	0.029	0.005	0.000	0.000	0.000	0.034
SE	**0.000**	**0.000**	**0.000**	**0.005**	**0.034**	**0.005**	**0.000**	**0.000**	**0.000**	**0.044**
SSE	0.000	0.000	0.000	0.054	0.054	0.010	0.000	0.000	0.000	0.117
S	0.000	0.000	0.005	0.044	0.136	0.054	0.000	0.000	0.000	0.238
SSW	0.000	0.000	0.000	0.015	0.083	0.136	0.005	0.000	0.000	0.238
SW	0.000	0.000	0.005	0.019	0.073	0.141	0.019	0.000	0.000	0.258
WSW	0.000	0.000	0.000	0.024	0.024	0.112	0.019	0.000	0.000	0.180
W	0.000	0.000	0.000	0.029	0.054	0.078	0.000	0.000	0.000	0.161
WNW	0.000	0.000	0.000	0.015	0.034	0.039	0.005	0.000	0.000	0.092
NW	0.000	0.000	0.000	0.010	0.005	0.073	0.000	0.000	0.000	0.088
NNW	0.000	0.000	0.005	0.010	0.044	0.097	0.005	0.000	0.000	0.161
SUBTOTAL	0.000	0.000	0.024	0.253	0.749	0.905	0.054	0.000	0.000	1.985

Bellefonte Nuclear Plant
Meteorological Tower Data
(04/01/2006-09/24/2008)

Joint Frequency Distributions by Stability Class (continued)

Stability Class C

WIND DIRECTION	WIND SPEED (MPH) CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.005	0.010	0.088	0.127	0.122	0.000	0.000	0.000	0.350
NNE	0.000	0.000	0.010	0.156	0.248	0.073	0.000	0.000	0.000	0.487
NE	0.000	0.000	0.005	0.102	0.161	0.097	0.005	0.000	0.000	0.370
ENE	0.000	0.000	0.000	0.063	0.058	0.005	0.000	0.000	0.000	0.127
E	0.000	0.000	0.000	0.019	0.029	0.005	0.000	0.000	0.000	0.054
ESE	0.000	0.000	0.000	0.034	0.019	0.029	0.000	0.000	0.000	0.083
SE	0.000	0.000	0.005	0.058	0.068	0.000	0.000	0.000	0.000	0.131
SSE	0.000	0.000	0.000	0.102	0.097	0.044	0.000	0.000	0.000	0.243
S	0.000	0.000	0.005	0.078	0.151	0.083	0.010	0.000	0.000	0.326
SSW	0.000	0.000	0.005	0.127	0.195	0.263	0.000	0.000	0.000	0.589
SW	0.000	0.000	0.005	0.092	0.195	0.302	0.024	0.000	0.000	0.618
WSW	0.000	0.000	0.010	0.073	0.102	0.161	0.029	0.010	0.000	0.384
W	0.000	0.000	0.005	0.058	0.097	0.097	0.005	0.000	0.000	0.263
WNW	0.000	0.000	0.019	0.063	0.058	0.097	0.000	0.000	0.000	0.238
NW	0.000	0.000	0.015	0.039	0.054	0.073	0.000	0.000	0.000	0.180
NNW	0.000	0.000	0.000	0.063	0.097	0.122	0.000	0.000	0.000	0.282
SUBTOTAL	0.000	0.005	0.092	1.217	1.757	1.572	0.073	0.010	0.000	4.725

Stability Class D

WIND DIRECTION	WIND SPEED (MPH) CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.068	1.387	1.494	1.100	0.929	0.010	0.000	0.000	4.988
NNE	0.000	0.054	1.961	2.822	1.022	0.292	0.005	0.000	0.000	6.156
NE	0.000	0.039	1.499	2.555	1.075	0.443	0.005	0.000	0.000	5.616
ENE	0.000	0.024	0.453	0.735	0.214	0.088	0.000	0.000	0.000	1.513
E	0.000	0.034	0.238	0.331	0.107	0.049	0.000	0.000	0.000	0.759
ESE	0.000	0.010	0.209	0.355	0.136	0.039	0.000	0.000	0.000	0.749
SE	0.000	0.000	0.219	0.584	0.345	0.200	0.049	0.000	0.000	1.397
SSE	0.000	0.000	0.282	0.696	0.380	0.273	0.015	0.000	0.000	1.645
S	0.000	0.024	0.360	0.852	0.633	0.569	0.127	0.010	0.000	2.574
SSW	0.000	0.005	0.448	1.095	1.139	1.431	0.097	0.000	0.000	4.214
SW	0.000	0.015	0.477	1.187	0.983	0.895	0.058	0.000	0.000	3.616
WSW	0.000	0.029	0.438	0.749	0.428	0.423	0.107	0.000	0.000	2.175
W	0.000	0.039	0.516	0.521	0.384	0.336	0.039	0.000	0.000	1.835
WNW	0.000	0.019	0.472	0.433	0.321	0.380	0.015	0.000	0.000	1.640
NW	0.000	0.063	0.589	0.491	0.404	0.409	0.024	0.000	0.000	1.981
NNW	0.000	0.058	0.954	0.822	0.608	0.779	0.029	0.000	0.000	3.251
SUBTOTAL	0.000	0.482	10.501	15.723	9.280	7.533	0.579	0.010	0.000	44.107

Bellefonte Nuclear Plant
Meteorological Tower Data
(04/01/2006-09/24/2008)

Joint Frequency Distributions by Stability Class (continued)

Stability Class E

WIND DIRECTION	WIND SPEED (MPH) CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.003	0.268	1.027	0.365	0.112	0.019	0.000	0.000	0.000	1.793
NNE	0.006	0.628	2.569	1.221	0.214	0.024	0.000	0.000	0.000	4.663
NE	0.007	0.676	2.915	1.041	0.234	0.039	0.005	0.000	0.000	4.917
ENE	0.002	0.389	0.662	0.204	0.024	0.029	0.000	0.000	0.000	1.311
E	0.001	0.156	0.224	0.097	0.010	0.005	0.000	0.000	0.000	0.492
ESE	0.001	0.156	0.195	0.092	0.034	0.015	0.000	0.000	0.000	0.492
SE	0.001	0.097	0.219	0.200	0.049	0.029	0.000	0.000	0.000	0.594
SSE	0.001	0.112	0.414	0.156	0.068	0.044	0.005	0.000	0.000	0.799
S	0.002	0.141	0.676	0.360	0.161	0.117	0.024	0.000	0.000	1.481
SSW	0.003	0.311	1.187	1.231	0.788	0.642	0.044	0.000	0.000	4.207
SW	0.003	0.282	1.168	0.861	0.521	0.190	0.010	0.000	0.000	3.035
WSW	0.002	0.165	0.618	0.307	0.131	0.029	0.005	0.000	0.000	1.257
W	0.001	0.122	0.355	0.102	0.044	0.015	0.000	0.000	0.000	0.638
WNW	0.001	0.083	0.268	0.078	0.029	0.010	0.000	0.000	0.000	0.468
NW	0.001	0.102	0.389	0.083	0.034	0.019	0.000	0.000	0.000	0.629
NNW	0.001	0.122	0.350	0.165	0.039	0.010	0.000	0.000	0.000	0.687
SUBTOTAL	0.034	3.810	13.236	6.564	2.491	1.236	0.092	0.000	0.000	27.465

Stability Class F

WIND DIRECTION	WIND SPEED (MPH) CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.005	0.214	0.170	0.005	0.000	0.000	0.000	0.000	0.000	0.394
NNE	0.010	0.438	0.380	0.019	0.015	0.000	0.000	0.000	0.000	0.862
NE	0.017	0.681	0.706	0.054	0.005	0.000	0.000	0.000	0.000	1.463
ENE	0.014	0.672	0.453	0.019	0.010	0.000	0.000	0.000	0.000	1.167
E	0.010	0.662	0.175	0.015	0.000	0.000	0.000	0.000	0.000	0.862
ESE	0.007	0.418	0.165	0.000	0.000	0.000	0.000	0.000	0.000	0.591
SE	0.007	0.394	0.151	0.019	0.010	0.000	0.000	0.000	0.000	0.581
SSE	0.007	0.428	0.141	0.000	0.005	0.000	0.000	0.000	0.000	0.581
S	0.014	0.745	0.365	0.010	0.000	0.000	0.000	0.000	0.000	1.133
SSW	0.021	0.900	0.764	0.107	0.015	0.000	0.000	0.000	0.000	1.807
SW	0.015	0.477	0.706	0.117	0.015	0.005	0.000	0.000	0.000	1.334
WSW	0.005	0.204	0.209	0.029	0.005	0.000	0.000	0.000	0.000	0.453
W	0.003	0.088	0.112	0.010	0.000	0.000	0.000	0.000	0.000	0.212
WNW	0.001	0.044	0.068	0.005	0.000	0.005	0.000	0.000	0.000	0.123
NW	0.002	0.063	0.122	0.005	0.000	0.000	0.000	0.000	0.000	0.192
NNW	0.002	0.083	0.058	0.015	0.005	0.000	0.000	0.000	0.000	0.162
SUBTOTAL	0.141	6.511	4.745	0.428	0.083	0.010	0.000	0.000	0.000	11.917

Bellefonte Nuclear Plant
Meteorological Tower Data
(04/01/2006-09/24/2008)

Joint Frequency Distributions by Stability Class (continued)

Stability Class G

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
	WIND SPEED (MPH)									
N	0.007	0.238	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.285
NNE	0.009	0.248	0.097	0.000	0.000	0.000	0.000	0.000	0.000	0.354
NE	0.016	0.384	0.238	0.000	0.000	0.000	0.000	0.000	0.000	0.639
ENE	0.018	0.535	0.170	0.005	0.000	0.000	0.000	0.000	0.000	0.729
E	0.016	0.545	0.073	0.000	0.000	0.000	0.000	0.000	0.000	0.634
ESE	0.015	0.555	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.604
SE	0.014	0.482	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.549
SSE	0.019	0.618	0.097	0.005	0.000	0.000	0.000	0.000	0.000	0.739
S	0.022	0.701	0.161	0.000	0.000	0.000	0.000	0.000	0.000	0.884
SSW	0.031	0.822	0.375	0.015	0.000	0.000	0.000	0.000	0.000	1.243
SW	0.024	0.530	0.409	0.010	0.000	0.000	0.000	0.000	0.000	0.973
WSW	0.011	0.311	0.097	0.010	0.000	0.000	0.000	0.000	0.000	0.429
W	0.006	0.136	0.102	0.000	0.000	0.000	0.000	0.000	0.000	0.245
WNW	0.004	0.097	0.063	0.005	0.000	0.000	0.000	0.000	0.000	0.170
NW	0.005	0.127	0.073	0.000	0.000	0.000	0.000	0.000	0.000	0.205
NNW	0.005	0.136	0.063	0.000	0.000	0.000	0.000	0.000	0.000	0.205
SUBTOTAL	0.224	6.467	2.146	0.049	0.000	0.000	0.000	0.000	0.000	8.886

All Stability Classes

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
	WIND SPEED (MPH)									
N	0.028	0.780	2.643	1.939	1.385	1.158	0.009	0.000	0.000	7.944
NNE	0.052	1.333	4.941	4.166	1.546	0.411	0.005	0.000	0.000	12.454
NE	0.059	1.768	5.343	3.787	1.523	0.648	0.019	0.000	0.000	13.147
ENE	0.028	1.631	1.768	1.026	0.326	0.128	0.000	0.000	0.000	4.908
E	0.018	1.409	0.714	0.454	0.156	0.061	0.000	0.000	0.000	2.812
ESE	0.014	1.163	0.586	0.487	0.227	0.090	0.000	0.000	0.000	2.568
SE	0.013	0.983	0.643	0.846	0.544	0.246	0.052	0.000	0.000	3.328
SSE	0.018	1.168	0.946	1.036	0.662	0.392	0.019	0.000	0.000	4.240
S	0.026	1.617	1.556	1.381	1.173	0.884	0.156	0.009	0.000	6.802
SSW	0.040	2.085	2.747	2.620	2.331	2.577	0.147	0.000	0.000	12.547
SW	0.034	1.300	2.761	2.341	1.825	1.641	0.128	0.000	0.000	10.029
WSW	0.017	0.714	1.371	1.201	0.700	0.771	0.161	0.009	0.000	4.944
W	0.012	0.378	1.083	0.733	0.624	0.577	0.052	0.000	0.000	3.459
WNW	0.010	0.241	0.908	0.586	0.454	0.539	0.019	0.000	0.000	2.757
NW	0.013	0.355	1.173	0.610	0.496	0.572	0.024	0.000	0.000	3.242
NNW	0.015	0.407	1.447	1.059	0.794	1.059	0.038	0.000	0.000	4.819
SUBTOTAL	0.397	17.334	30.630	24.271	14.767	11.755	0.827	0.019	0.000	100.000

APPENDIX J – BLN METEOROLOGICAL TOWER DATA, COMPARISON OF DATA FROM DIFFERENT PERIODS

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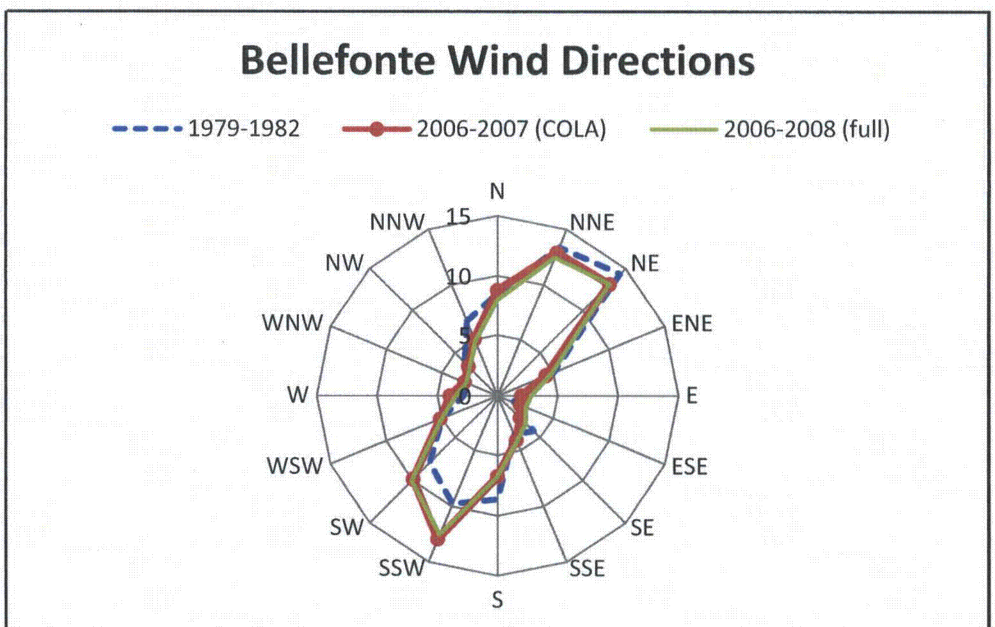
Bellefonte Nuclear Plant Meteorological Data
(Comparison of Data From Different Periods)

Wind Direction
(Percent Occurrence)

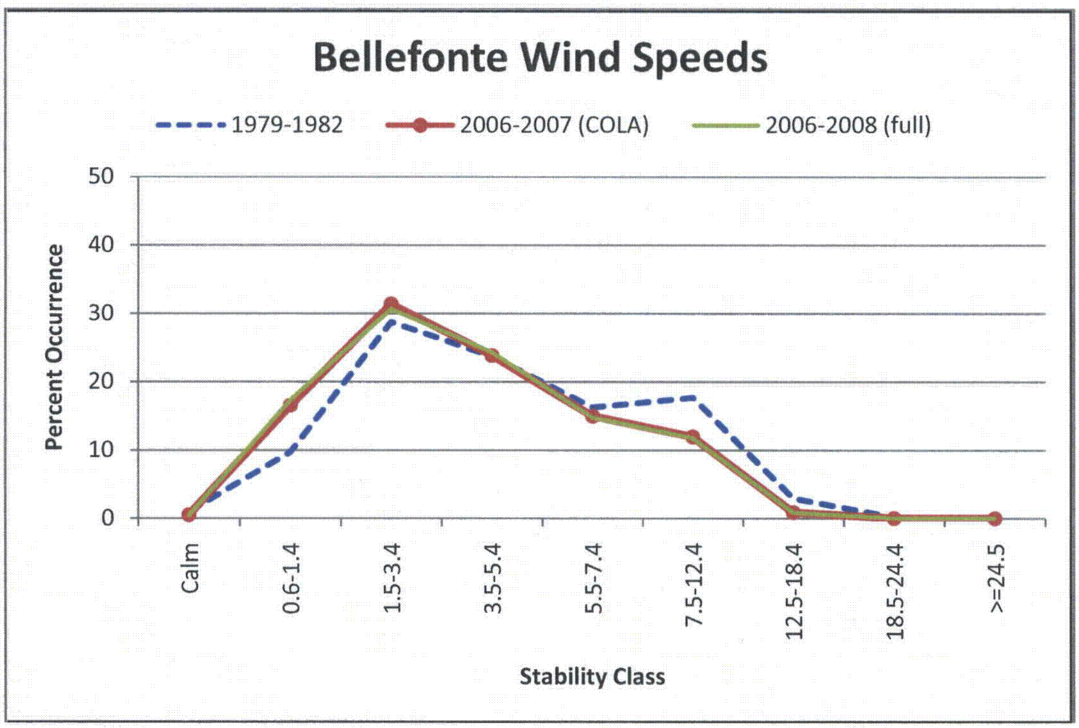
Wind Direction (blowing from)	1979-1982	2006-2007 (COLA)	2006-2008 (full)
N	8.516	8.778	7.944
NNE	13.384	12.899	12.454
NE	14.362	13.133	13.147
ENE	5.047	4.354	4.908
E	2.179	2.000	2.812
ESE	1.370	2.045	2.568
SE	4.223	2.662	3.328
SSE	3.596	4.080	4.240
S	8.644	6.765	6.802
SSW	9.763	12.956	12.547
SW	7.969	9.873	10.029
WSW	4.927	5.137	4.944
W	2.825	3.928	3.459
WNW	2.662	2.958	2.757
NW	3.863	3.411	3.242
NNW	6.669	5.020	4.819



Bellefonte Nuclear Plant Meteorological Data
(Comparison of Data From Different Periods)

Wind Speed
(Percent Occurrence)

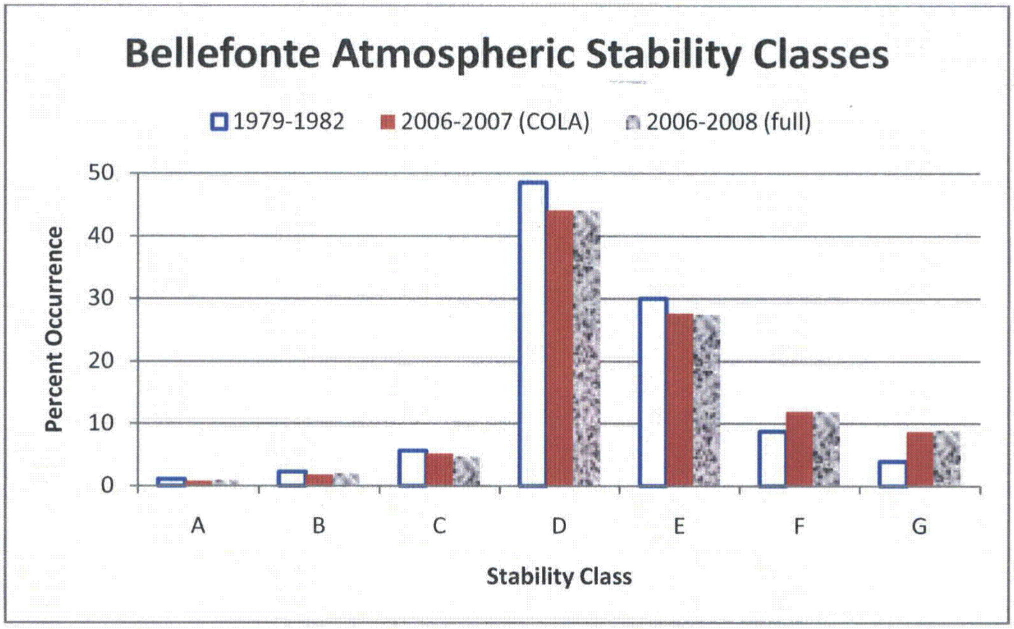
Wind Speed Range (mph)	1979-1982	2006-2007 (COLA)	2006-2008 (full)
Calm	0.928	0.459	0.397
0.6-1.4	9.713	16.542	17.334
1.5-3.4	28.719	31.387	30.630
3.5-5.4	23.654	23.804	24.271
5.5-7.4	16.247	14.971	14.767
7.5-12.4	17.682	11.954	11.755
12.5-18.4	2.893	0.860	0.827
18.5-24.4	0.152	0.023	0.019
>=24.5	0.011	0.000	0.000



Bellefonte Nuclear Plant Meteorological Data
(Comparison of Data From Different Periods)

Stability Class
(Percent Occurrence)

Stability Class	1979-1982	2006-2007 (COLA)	2006-2008 (full)
A	1.040	0.750	0.915
B	2.252	1.774	1.985
C	5.628	5.154	4.725
D	48.490	44.102	44.107
E	29.970	27.580	27.465
F	8.702	11.927	11.917
G	3.919	8.713	8.886



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APPENDIX K – TORNADOES IN JACKSON COUNTY, ALABAMA, 1980 TO 2008

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Tornadoes in Jackson County, Alabama during 1980-2008:

Date	Location	F-Class	Within 10 miles of Bellefonte (Y/N)?
July 22, 1982	Just NE of Holly Tree	F0	N
August 16, 1985	Section	F0	Y
May 8, 1988	3 [mile] SW Stevenson to near Cartersville	F2	N
November 15, 1989	Stevenson community	F1	N
May 18, 1995	Near Athens to near Scottsboro	F4	N
March 16, 1996	Between Pisgah and Rosalie	F1	N
January 5, 1997	Flat Rock	F0	N
May 24, 2001	0.5 NW Aspel to 0.5 NE of Aspel	F1	N
March 19, 2003	Section to Rosalie	F1	Y
March 19, 2003	2 NE Dutton to 3 NE Dutton	F1	Y
March 19, 2003	2 SW Flat Rock to 2 NE Flat Rock	F1	N
May 6, 2003	Hollywood to 3 NE Hollywood	F0	Y
May 6, 2003	5 NE of Hollywood to 6 NE Hollywood	F0	Y
August 20, 2004	1 W Skyline to Skyline	F0	N
April 3, 2007	3 miles E of Langston to Macedonia	EF1*	N
February 6, 2008	1.0 SSE Pisgah to 1.1SE Flat Rock	EF4	Y
December 10, 2008	1.0 SE Tupelo to 2.1 ENE Pikeville	EF2	Y

Source: Huntsville NWS web site (http://www.srh.noaa.gov/hun/?n=jacksontor)

*NWS introduced the Enhanced Fujita (EF) Scale on February 1, 2007 to better estimate tornado wind speeds based on a more objective assessment of storm damage. The wind speed values for each class are provided below. Source: *<http://www.spc.noaa.gov/efscale/ef-scale.html>*).

F/EF-Class	Wind Speed (3-sec gust, mph)	
	F-Scale	EF-Scale (operational)
0	45-78	65-85
1	79-117	86-110
2	118-161	111-135
3	162-209	136-165
4	210-261	166-200
5	262-317	>200

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APPENDIX L – POWER SYSTEM OPERATIONS ENVIRONMENTAL PROTECTION PROCEDURES RIGHT-OF-WAY VEGETATION MANAGEMENT GUIDELINES

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

1.0 Overview

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

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

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

2.0 Right-of-Way Management Options

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

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

C. In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks, and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Safety and Health Administration. For that reason, TVA is actively looking at better control methods, including use of low-volume herbicide applications, occasional single tree injections, and tree growth regulators (TGRs).

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

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

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

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

3.0 Herbicide Program

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

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

Trade Name	Active Ingredients	Label Signal Word
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Krenite S	Fosamine Ammonium	Caution
Pathfinder II	Triclopyr/RTU	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Spike 20P	Tebuthiuron	Caution
Transline	Clopyralid/Liquid	Caution

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

Trade Name	Active Ingredients	Label Signal Word
Sahara	Diuron/Imazapyr	Caution
SpraKil SK-26	Tebuthiuron and Diuron	Caution
Topsite	Diuron/Imazapyr	Caution

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

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

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

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

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

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

F. Best management practices (BMPs) governing application of herbicides are contained within *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 1999), which is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation. Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. "Applicators" must be trained, licensed, and follow manufacturers' label instructions, U.S. Environmental Protection Agency (USEPA) guidelines, and respective state regulations and laws.

G. When herbicides are used, their potential adverse impacts are considered in selecting the compound, formulation, and application method. Herbicides that are designated "Restricted Use" by USEPA require application by or under the supervision of applicators certified by the respective state control board. Aerial and ground applications are either done by TVA or by contractors in accordance with the following guidelines identified in TVA's BMPs manual (Muncy 1999):

1. The sites to be treated are selected and application directed by the appropriate TVA official.

2. A preflight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.

3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed 5 miles per hour, in areas of fog, or during periods of temperature inversion.

4. Pellet application will normally not be made when the surface wind speeds exceed 10 miles per hour or on frozen or water-saturated soils.

5. Liquid application is not performed when the temperature reaches 95 degrees Fahrenheit or above.

6. Application during unstable, unpredictable, or changing weather patterns is avoided.

7. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.

8. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZs) (200 feet minimum width) adjacent to perennial streams, ponds, and other water sources. Hand application of certain herbicides labeled for use within SMZs is used only selectively.

9. Buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.

10. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits, (b) off the right-of-way, and (c) during rainy periods or during the 48-hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters, when soil active herbicides are used.

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

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

4.0 References

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

U.S. Forest Service. 1989a. *Vegetation Management in the Coastal Plain/Piedmont Final Environmental Impact Statement*, Volumes I and II. Southern Region Management Bulletin R8-MB-23, January 1989. Atlanta, Ga.: USDA Forest Service.

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

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Tennessee Valley Authority
Environmental Quality Protection Specifications
for Transmission Line Construction

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor shall plan, coordinate, and conduct operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting. This specification contains provisions that shall be considered in all TVA and contract construction operations. If the contractor fails to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all structure and conductor pulling sites, protective measures to prevent erosion will be taken immediately upon the end of each step in a construction sequence, and those protective measures will be inspected and maintained throughout the construction and right-of-way rehabilitation period.

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

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

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

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

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

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

6. Refuse Disposal - Designated TVA and/or contractor personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his operations and by his employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition, and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as waste. Contractors must meet similar provisions on any project contracted by TVA.

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

8. Sensitive Areas Preservation - Certain areas on site and along the right-of-way may be designated by the specifications or the TVA engineer as environmentally sensitive. These areas include but are not limited to areas classified as erodible, geologically sensitive, scenic, historical and archaeological, fish and wildlife refuges, water supply watersheds, and public recreational areas such as parks and monuments. Contractors and TVA construction crews shall take all necessary actions to avoid adverse impacts to these sensitive areas and their adjacent buffer zones. These actions may include suspension of work or change of operations during periods of rain or heavy public use; hours may be restricted or concentrations of noisy equipment may have to be dispersed. If prehistoric or historic artifacts or features are encountered during clearing or construction operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's right-of-way inspector or construction superintendent and Cultural Resources Program shall be notified. The site shall be left as found until a significance determination is made. Work may continue elsewhere beyond the 100-foot perimeter.

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

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

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

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

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

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

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

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

implemented as soon as practicable after disturbance in accordance with applicable federal, state, and/or local storm water regulations.

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

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

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

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

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

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

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

15. Dust and Mud Control - Construction activities shall be conducted to minimize the creation of dust. This may require limitations as to types of equipment, allowable speeds, and routes utilized. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used subject to TVA's approval. On new construction sites and easements, the last 100 feet before an access

road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

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

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

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

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

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

21. Damages - The movement of construction crews and equipment shall be conducted in a manner that causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor will be responsible for erosion damage caused by his actions and especially for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil and subsoil problems themselves, the section of the contract dealing with damages will apply.

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APPENDIX N – TENNESSEE VALLEY AUTHORITY TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS

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Tennessee Valley Authority
Transmission Construction Guidelines Near Streams

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

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Environmental Stewardship and Policy staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard stream protection, (B) protection of important permanent streams, or (C) protection of unique habitats. These category designations are based on the variety of species and habitats that exist in the stream as well as state and federal requirements to avoid harming certain species. The category designation for each site will be marked on the plan and profile sheets. Construction crews are required to protect streams and other identified water habitats using the following pertinent set(s) of guidelines:

(A) Standard Stream Protection

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

Guidelines:

1. All construction work around streams will be done using pertinent best management practices (BMPs) such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

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

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to

minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the presence of important sports fish (trout, for example) and habitats for federal endangered species. The purpose of the following guidelines is to minimize the disturbance of the banks and water in the flowing stream(s) where this level of protection is required.

Guidelines:

1. Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

2. All equipment crossings of streams must comply with appropriate state (and, at times, federal) permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.

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

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

(C) Protection of Unique Habitats

This category will be used when, for one or more specific reasons, a temporary or permanent aquatic habitat requires special protection. This relatively uncommon level of protection will be appropriate and required when a unique habitat (for example, a particular spring run) or protected species (for example, one that breeds in a wet-weather ditch) is known to occur on or adjacent to the construction corridor. The purpose of the following guidelines is to avoid or minimize any disturbance of the unique aquatic habitat.

Guidelines:

1. Except as modified by Guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

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

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

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

Additional Help

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

Revision April 2007

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

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
1. Reference	All TVA construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."	Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."	Except as modified by guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."
2. Equipment Crossings	All crossings of streams must comply with appropriate state and federal permitting requirements. Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.	All crossings of streams must comply with appropriate state and federal permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.	All crossings of streams also must comply with appropriate state and federal permitting requirements. All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat.

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

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
3. **Cutting Trees**	Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.	Cutting of trees with SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams must be limited to those meeting National Electric Safety Code and danger tree requirements. Stumps can be cut close to ground level but must not be removed or uprooted.	Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. Stumps must not be removed, uprooted, or cut shorter than 1 foot above the ground line.
4. **Other Vegetation**	Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.	Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.	Other vegetation near the unique habitat must be disturbed as little as possible during construction. The soil must not be disturbed by plowing, disking, blading, or grading. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

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APPENDIX O – STATE-LISTED ANIMAL AND PLANT SPECIES PRESENT IN AREAS AFFECTED BY TRANSMISSION LINE WORK

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Table O-1. State-Listed Aquatic Animal Species Present in Counties Affected Transmission Line Upgrades

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Insects				
A caddisfly	*Hydropsyche rotosa*	RARE, S1	-	-
A caddisfly	*Hydropsyche simulans*	RARE, S1	-	-
A caddisfly	*Rhyacophila alabama*	POTL, S1	-	-
A caddisfly	*Rhyacophila fenestra*	RARE, S1	-	-
A glossosomatid caddisfly	*Agapetus hessi*	TRKD, S1	-	-
Tennessee clubtail dragonfly	*Gomphus sandrius*	-	-	TRKD, S1
Snails				
Anthony's river snail*#	*Athearnia anthonyi*	PROT, S1	-	END, S1
Armored rocksnail*	*Lithasia armigera*	-	-	TRKD, S1S2
Armored snail	*Pyrgulopsis pachyta*	PROT, S1	-	-
Corpulent hornsnail*	*Pleurocera corpulenta*	TRKD, S1	-	TRKD, S1
Helmet rock snail*	*Lithasia duttoniana*	-	-	TRKD, S2
Ornate rocksnail*	*Lithasia geniculata*	-	-	TRKD, S3
Owen spring limnephilid caddisfly	*Glyphopsyche sequatchie*	-	-	POTL, -
Royal marstonia	*Pyrgulopsis ogmorhaphe*	-	-	END, S1
Rugose rocksnail	*Lithasia jayana*	-	-	TRKD, S2
Skirted hornsnail*	*Pleurocera pyrenella*	TRKD, S2	-	-
Slabside pearlymussel	*Lexingtonia dolabelloides*	PROT, S1	-	TRKD, S2
Slender campeloma*	*Campeloma decampi*	PROT, S1	-	-
Smooth mudalia*	*Leptoxis virgata*	-	-	TRKD, S1
Spiny riversnail*	*Io fluvialis*	EXTI, SX	-	TRKD, S2
Spiral hornsnail	*Pleurocera brumbyi*	TRKD, S2	-	-
Umbilicate river snail	*Leptoxis subglobosa umbilicata*	-	-	TRKD, S1
Varicose rocksnail*	*Lithasia verrucosa*	TRKD, S3	-	-
Warty rocksnail*	*Lithasia lima*	HIST, SH	-	TRKD, S2
Mussels				
Acornshell	*Epioblasma haysiana*	EXTI?, SH	-	-
Alabama lampmussel#	*Lampsilis virescens*	PROT, S1	-	-
Alabama moccasinshell	*Medionidus acutissimus*	-	THR, S1	-
Angled riffleshell	*Epioblasma biemarginata*	EXTI?, SX	-	-
Birdwing pearlymussel	*Lemiox rimosus*	PROT, SX	-	-
Butterfly*	*Ellipsaria lineolata*	TRKD, S3	-	-
Cracking pearlymussel	*Hemistena lata*	PROT, SX	-	-
Cumberland bean	*Villosa trabalis*	PROT, SX	HIST, SH	-

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Cumberland combshell	*Epioblasma brevidens*	PROT, S1	-	-
Cumberland moccasinshell	*Medionidus conradicus*	PROT, S1	-	-
Cumberland monkeyface	*Quadrula intermedia*	PROT, S1	-	END, S1
Cumberland pigtoe	*Pleurobema gibberum*	-	-	END, S1
Deertoe	*Truncilla truncata*	TRKD, S1	-	-
Dromedary pearlymussel	*Dromus dromas*	PROT, S1	-	END, S1
Elktoe	*Alasmidonta marginata*	EXTI, SX	-	-
Fine-lined Pocketbook	*Lampsilis altilis*	-	THR, S2	-
Fine-rayed Pigtoe#	*Fusconaia cuneolus*	PROT, S1	-	-
Fluted kidneyshell	*Ptychobranchus subtentum*	PROT, SX	-	TRKD, S2S3
Hickorynut	*Obovaria olivaria*	EXTI, SX	-	-
Kidneyshell	*Ptychobranchus fasciolaris*	TRKD, S1	-	-
Monkeyface*	*Quadrula metanevra*	TRKD, S3	-	-
Mucket*	*Actinonaias ligamentina*	TRKD, S2	-	-
Narrow catspaw	*Epioblasma lenior*	EXTI?, SX	-	-
Ohio pigtoe	*Pleurobema cordatum*	TRKD, S2	-	-
Orange-foot Pimpleback	*Plethobasus cooperianus*	PROT, S1	-	END, S1
Painted creekshell	*Villosa taeniata*	TRKD, S3	-	-
Pale lilliput#	*Toxolasma cylindrellus*	PROT, S1	-	END, S1
Pheasantshell	*Actinonaias pectorosa*	TRKD, S1	-	-
Pink mucket*#	*Lampsilis abrupta*	PROT, S1	-	END, S2
Pink papershell*	*Potamilus ohiensis*	TRKD, S3	-	-
Purple lilliput	*Toxolasma lividus*	TRKD, S2	-	-
Rabbitsfoot	*Quadrula cylindrica cylindrica*	PROT, S1	-	TRKD, S3
Rainbow	*Villosa iris*	TRKD, S3	-	-
Ring pink	*Obovaria retusa*	PROT, S1	-	-
Rough pigtoe*	*Pleurobema plenum*	PROT, S1	-	END, S1
Round hickorynut	*Obovaria subrotunda*	TRKD, S2	-	TRKD, S3
Sheepnose	*Plethobasus cyphyus*	PROT, S1	-	-
Shiny pigtoe pearlymussel#	*Fusconaia cor*	PROT, S1	-	-
Slabside pearlymussel*	*Lexingtonia dolabelloides*	PROT, S1	-	TRKD, S1
Slippershell mussel	*Alasmidonta viridis*	PROT, S1	-	-
Snuffbox	*Epioblasma triquetra*	TRKD, S1	-	-
Southern pigtoe	*Pleurobema georgianum*	-	END, S1	-
Spectaclecase	*Cumberlandia monodonta*	PROT, S1	-	TRKD, S2S3
Spike	*Elliptio dilatata*	TRKD, S1	-	-

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Tan riffleshell	*Epioblasma florentina walkeri*	PROT, SX	-	END, S1
Tennessee clubshell	*Pleurobema oviforme*	TRKD, S1	-	TRKD, S2S3
Tennessee heelsplitter	*Lasmigona holstonia*	TRKD, S1S2	-	TRKD, S2
Tennessee pigtoe*	*Fusconaia barnesiana*	TRKD, S1	-	-
Tuberculed blossom pearlymussel	*Epioblasma torulosa torulosa*	PROT, SX	-	EXTI, SX
Turgid blossom pearlymussel	*Epioblasma turgidula*	-	-	EXTI, SX
Wavy-rayed Lampmussel	*Lampsilis fasciola*	TRKD, S1S2	-	-
White heelsplitter	*Lasmigona complanata*	TRKD, S2S3	-	-
Crayfish				
A troglobitic crayfish*	*Cambarus veitchorum*	TRKD, S1	-	-
Chickamauga crayfish	*Cambarus extraneus*	-	-	THR, S1;S2
Troglobitic crayfish*	*Cambarus jonesi*	SPCO, S2	-	-
Troglobitic crayfish	*Procambarus pecki*	TRKD, S2?	-	-
Fish				
Ashy darter	*Etheostoma cinereum*	-	TRKD, S1	THR, S2S3
Barrens darter	*Etheostoma forbesi*	-	-	END, S1
Barrens topminnow	*Fundulus julisia*	-	-	END, S1
Bedrock shiner	*Notropis rupestris*	-	-	NMGT, S2
Bigeye chub	*Hybopsis amblops*	TRKD, S3	RARE, S1S2	-
Blotched chub	*Erimystax insignis*	TRKD, S2	-	-
Blotchside logperch	*Percina burtoni*	TRKD, S1	-	NMGT, S2
Bluebreast darter	*Etheostoma camurum*	TRKD, S1	-	-
Blueside darter	*Etheostoma jessiae*	TRKD, S3	-	-
Boulder darter	*Etheostoma wapiti*	PROT, S1	-	-
Chestnut lamprey	*Ichthyomyzon castaneus*	TRKD, S2	-	-
Coppercheek darter	*Etheostoma aquali*	-	-	THR, S2S3
Dusky darter	*Percina sciera*	-	RARE, S1	-
Fantail darter	*Etheostoma flabellare*	TRKD, S3	-	-
Flame chub	*Hemitremia flammea*	TRKD, S3	END, S1	NMGT, S3
Gilt darter	*Percina evides*	TRKD, S2	-	-
Golden darter	*Etheostoma denoncourti*	-	-	NMGT, S2
Highfin carpsucker	*Carpiodes velifer*	-	-	NMGT, S2S3
Longhead darter	*Percina macrocephala*	-	-	THR, S2
Mountain madtom	*Noturus eleutherus*	TRKD, S1	-	-
Northern studfish	*Fundulus catenatus*	-	THR, S1	-
Ohio lamprey	*Ichthyomyzon bdellium*	-	RARE, S3?	-
Paddlefish	*Polyodon spathula*	PROT, S3	-	-

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Palezone shiner#	*Notropis albizonatus*	PROT, S1	-	-
Popeye shiner	*Notropis ariommus*	-	THR, S1	-
Redband darter	*Etheostoma luteovinctum*	-	-	NMGT, S4
Redline darter	*Etheostoma rufilineatum*	TRKD, S3	-	-
River carpsucker	*Carpiodes carpio*	TRKD, S2	-	-
River darter	*Percina shumardi*	TRKD, S3	-	-
Rosyface shiner	*Notropis micropteryx*	TRKD, S2	-	-
Saddled madtom	*Noturus fasciatus*	-	-	THR, S2
Silver redhorse	*Moxostoma anisurum*	TRKD, S2	-	-
Silver shiner	*Notropis photogenis*	TRKD, S1	-	-
Slackwater darter	*Etheostoma boschungi*	PROT, S1	-	-
Slender madtom	*Noturus exilis*	TRKD, S3	-	-
Slenderhead darter	*Percina phoxocephala*	-	-	NMGT, S3
Snail darter	*Percina tanasi*	-	THR, S1	THR, S2S3
Snubnose darter	*Etheostoma simoterum*	TRKD, S3	-	-
Southern cavefish	*Typhlichthys subterraneus*	PROT, S3	RARE, S1	NMGT, S3
Southern redbelly dace	*Phoxinus erythrogaster*	TRKD, S3	-	-
Spotfin chub	*Cyprinella monacha*	-	EXTI, SH	-
Spring pygmy sunfish	*Elassoma alabamae*	PROT, S1	-	-
Stargazing minnow	*Phenacobius uranops*	TRKD, S1	THR, S1	-
Stonecat	*Noturus flavus*	TRKD, S1	-	-
Striated darter	*Etheostoma striatulum*	-	-	THR, S1
Stripetail darter	*Etheostoma kennicotti*	TRKD, S3	-	-
Tennessee dace	*Phoxinus tennesseensis*	-	-	NMGT, S3
Tuscumbia darter	*Etheostoma tuscumbia*	PROT, S2	-	-
Yellowfin madtom	*Noturus flavipinnis*	-	EXTI, SH	-

Species that are known to occur in watersheds directly affected by construction activities are indicated by (*).

Species reported from Jackson County, Alabama are indicated by (#)

Status Codes: **THR** = Threatened; **TRKD** = Tracked by state Natural Heritage program; **RARE** = Listed Rare by the state; **NMGT** = In Need of Management; **PROT** = State Protected; **SPCO** = Listed Special Concern; **EXTI** = Listed Extirpated or Extinct

State Ranks: **S1** = Critically Imperiled; **S2** = Imperiled; **S3** = Vulnerable; **SH** = Historic; **?** = Inexact or Uncertain; **SX** = Presumed Extirpated

Table O-2. State-Listed Terrestrial Plant Species Known From Within a 5-Mile Vicinity of the Transmission Line Upgrades

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
Chalk Maple	*Acer leucoderme*	-	-	SPCO(S3)
Sweetflag	*Acorus calamus*	SLNS(S1)	-	-
Yellow Giant-hyssop[1]	*Agastache nepetoides*	SLNS(S1)	SPCO(S1)	-
Roundleaf Serviceberry	*Amelanchier sanguinea*	THR(S2)	-	-
Price's Potato-bean	*Apios priceana*	SLNS(S2)	-	END(S2)
Spreading Rockcress	*Arabis patens*	-	-	END(S1)
American Spikenard	*Aralia racemosa*	SLNS(S1)	-	-
Bradley's Spleenwort	*Asplenium bradleyi*	SLNS(S2)	-	-
Wall-rue Spleenwort	*Asplenium ruta-muraria*	SLNS(S2)	-	-
American Hart's-tongue Fern[2]	*Asplenium scolopendrium* var. *americanum*	SLNS(S1)	-	END(S1)
Maidenhair Spleenwort	*Asplenium trichomanes*	SLNS(S2S3)	-	-
Spreading False-foxglove	*Aureolaria patula*	-	-	SPCO(S3)
Nuttall's Rayless Golden-rod	*Bigelowia nuttallii*	SLNS(S3)	-	-
Mountain Bitter Cress	*Cardamine clematitis*	-	-	THR(S2)
Sedge	*Carex hirtifolia*	-	-	SPCO(S1S2)
Sedge	*Carex purpurifera*	SLNS(S2)	-	-
Alabama Lipfern	*Cheilanthes alabamensis*	SLNS(S3)	-	-
Pink Turtlehead	*Chelone lyonii*	SLNS(S1)	-	-
Yellowwood	*Cladrastis kentukea*	SLNS(S3)	-	-
Leather-flower	*Clematis glaucophylla*	-	-	END(S1)
Morefield's Leather-flower[2]	*Clematis morefieldii*	SLNS(S1)	-	-
Wister Coral-root	*Corallorhiza wisteriana*	SLNS(S2)	-	-
Woodland Tickseed	*Coreopsis pulchra*	SLNS(S2)	-	-
American Smoke-tree	*Cotinus obovatus*	SLNS(S2)	-	SPCO(S2)
Harper's Dodder	*Cuscuta harperi*	SLNS(S2)	-	-
Pink Lady-slipper	*Cypripedium acaule*	SLNS(S3)	-	S-CE(S4)
Large Yellow Lady's-slipper	*Cypripedium pubescens*	SLNS(S3)	-	-
Tennessee Bladderfern	*Cystopteris tennesseensis*	SLNS(S2)	-	-
Leafy Prairie-clover[2]	*Dalea foliosa*	SLNS(S1)	-	END(S2S3)
Bog Oat-grass	*Danthonia epilis*	-	-	SPCO(S1S2)
Tall Larkspur	*Delphinium exaltatum*	-	-	END(S2)
Dwarf Larkspur[1]	*Delphinium tricorne*	-	SPCO(S2?)	-
Small's Stonecrop[1]	*Diamorpha smallii*	SLNS(S3)	-	END(S1S2)
American Beakgrain	*Diarrhena americana*	SLNS(S2)	-	-
Dutchman's Breeches[1]	*Dicentra cucullaria*	SLNS(S2)	-	-
Panic-grass	*Dichanthelium acuminatum ssp leucothrix*	-	-	SPCO(S1)
Northern Bush-honeysuckle	*Diervilla lonicera*	-	-	THR(S2)
Mountain Bush-honeysuckle	*Diervilla sessilifolia* var. *rivularis*	-	-	THR(S2)
Spotted Mandarin	*Disporum maculatum*	SLNS(S1)	-	-
Wolf Spikerush	*Eleocharis wolfii*	-	-	END(S1)
Common Horsetail	*Equisetum arvense*	SLNS(S2)	-	-
Wahoo	*Euonymus atropurpureus*	SLNS(S3)	-	-
Creeping Aster	*Eurybia surculosa*	SLNS(S1)	-	-

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
American Columbo[1]	*Frasera caroliniensis*	SLNS(S2)	-	-
Fragrant Bedstraw	*Galium uniflorum*	-	-	SPCO(S1)
Dwarf Huckleberry	*Gaylussacia dumosa*	-	-	THR(S3)
Yellow Jessamine	*Gelsemium sempervirens*	-	-	SPCO(S1S2)
Pale Avens	*Geum virginianum*	SLNS(S1)	-	-
Manna-grass	*Glyceria acutiflora*	-	-	SPCO(S2)
Florida Hedge-hyssop	*Gratiola floridana*	-	-	END(S1)
Carolina Silverbell	*Halesia carolina*	SLNS(S2)	-	-
Eggert's Sunflower	*Helianthus eggertii*	-	-	SPCO(S3)
White-leaved Sunflower	*Helianthus glaucophyllus*	SLNS(SH)	-	-
Featherfoil	*Hottonia inflata*	-	-	SPCO(S2)
Goldenseal	*Hydrastis canadensis*	SLNS(S2)	-	S-CE(S3)
Creeping St. John's-wort	*Hypericum adpressum*	-	-	END(S1)
Barrens St. Johnswort[1]	*Hypericum sphaerocarpum*	-	SPCO(S1)	-
Narrow Blue Flag	*Iris prismatica*	-	-	THR(S2S3)
Butler's Quillwort	*Isoetes butleri*	SLNS(S2)	-	-
Appalachian Quillwort	*Isoetes engelmannii*	SLNS(S3)	-	-
Small Whorled Pogonia	*Isotria medeoloides*	-	-	END(S1)
Large Whorled Pogonia	*Isotria verticillata*	SLNS(S2)	-	-
Twinleaf	*Jeffersonia diphylla*	SLNS(S2)	-	-
Butternut	*Juglans cinerea*	-	-	THR(S3)
Fleshy-fruit Gladecress[2]	*Leavenworthia crassa*	SLNS(S1)	-	-
Glade Cress	*Leavenworthia exigua* var. *exigua*	-	THR(S2)	SPCO(S3)
Michaux Leavenworthia	*Leavenworthia uniflora*	SLNS(S2)	-	-
Slender Blazing-star	*Liatris cylindracea*	-	-	THR(S2)
Canada Lily	*Lilium canadense*	-	-	THR(S3)
Michigan Lily	*Lilium michiganense*	-	-	THR(S3)
Wood Lily	*Lilium philadelphicum*	-	-	END(S1)
Mountain Honeysuckle	*Lonicera dioica*	-	-	SPCO(S2)
Yellow Honeysuckle	*Lonicera flava*	-	-	THR(S1)
Fraser Loosestrife	*Lysimachia fraseri*	-	-	END(S2)
Mohr's Barbara's Buttons	*Marshallia mohrii*	-	THR(S2)	-
Broadleaf Barbara's-buttons	*Marshallia trinervia*	-	-	THR(S2S3)
Broadleaf Bunchflower	*Melanthium latifolium*	-	-	END(S1S2)
False Helleborne	*Melanthium parviflorum*	SLNS(S1S2)	-	-
American Pinesap	*Monotropa hypopithys*	SLNS(S2)	-	-
Nestronia	*Nestronia umbellula*		-	END(S1)
Alabama Snow-wreath	*Neviusia alabamensis*	SLNS(S2)	-	-
Hairy False Gromwell	*Onosmodium hispidissimum*	-	-	END(S1)
One-flowered Broomrape	*Orobanche uniflora*	SLNS(S2)	-	-
Great Yellow Wood-sorrel	*Oxalis grandis*	SLNS(S1)	-	-
American Ginseng	*Panax quinquefolius*	-	-	S-CE(S3S4)
Large-leaved Grass-of-parnassus	*Parnassia grandifolia*	-	-	SPCO(S3)
Monkey-face Orchid	*Platanthera integrilabia*	SLNS(S2)	-	END(S2S3)
Greek Valerian	*Polemonium reptans*	-	SPCO(S1)	-
Tennessee Leafcup	*Polymnia laevigata*	SLNS(S2S3)	-	-
Carolina Rhododendron	*Rhododendron minus*	SLNS(S2)	-	-

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
Granite Gooseberry	*Ribes curvatum*	SLNS(S2)	-	THR(S1)
Prickly Gooseberry	*Ribes cynosbati*	SLNS(S1S2)	-	-
Rose-gentian[1]	*Sabatia capitata*	END(S2)	-	-
Gibbous Panic-grass	*Sacciolepis striata*	SPCO(S1)	-	-
Pussy Willow	*Salix humilis*	SLNS(S2S3)	-	-
Green Pitcher Plant[2]	*Sarracenia oreophila*	SLNS(S2)	-	-
Sunnybell	*Schoenolirion croceum*	SLNS(S2)	-	-
Large-flowered Skullcap[1]	*Scutellaria montana*	THR(S2)	THR(S2)	-
Chaffseed[2]	*Schwalbea americana*	-	-	E-P(SX)
Nevius' Stonecrop	*Sedum nevii*	SLNS(S3)	-	END(S1)
Ovate Catchfly	*Silene ovata*	END(S2)	-	-
Cumberland Rosinweed	*Silphium brachiatum*	SLNS(S2)	-	-
Compass-plant	*Silphium laciniatum*	THR(S2)	-	-
Bog Goldenrod	*Solidago uliginosa*	SLNS(SH)	-	-
Virginia Spiraea	*Spiraea virginiana*	END(S2)	THR(S1)	-
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	-	END(S1)	SPCO(S1)
Mountain Camellia	*Stewartia ovata*	SLNS(S2S3)	-	-
Southern Morning-glory	*Stylisma humistrata*	-	-	THR(S1)
Smooth Blue Aster	*Symphyotrichum laeve* var. *concinnum*	SLNS(S1)	-	-
Limestone Fame-flower	*Talinum calcaricum*	-	-	SPCO(S3)
Fame-flower[1]	*Talinum mengesii*		-	THR(S2)
Appalachian Bristle Fern	*Trichomanes boschianum*		-	THR(S1S2)
Lance-leaf Trillium	*Trillium lancifolium*		-	END(S1)
Southern Red Trillium	*Trillium sulcatum*	SLNS(S1)	-	-
Horse-gentian	*Triosteum angustifolium*	SLNS(S1)	-	-
Canada Violet	*Viola canadensis*	SLNS(S2)	-	-
Eggleston's Violet[1]	*Viola egglestonii*	-	SPCO(S2)	-
Three-parted Violet	*Viola tripartita* var. *tripartita*	-	-	SPCO(S2S3)
Virginia Chainfern	*Woodwardia virginica*	-	-	SPCO(S2)
Death-camas	*Zigadenus leimanthoides*	-	-	THR(S2)

Status Codes: **END** = Endangered; **E-P** = Endangered – Possibly Extirpated; **THR** = Threatened; **RARE** = Rare; **SLNS** = Listed by the state of Alabama, but not assigned a status; **SPCO** = Special Concern; **S-CE** =Special Concern-Commercially Exploited

Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **S4** = Apparently secure; **SX** = Presumed extirpated; **S#S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); **?** = Denotes uncertainty in exact rarity of the element.

Table O-3. State-Listed Terrestrial Animal Species Reported From Jackson, Limestone, and Morgan Counties, Alabama; Dade, Catoosa, and Walker Counties, Georgia; and Bedford, Coffee, Hamilton, Marion, and Sequatchie Counties, Tennessee

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
Amphibians				
Barking treefrog	*Hyla gratiosa*	-	-	NMGT[1] (S3)[2]
Green salamander	*Aneides aeneus*	PROT (S3)	RARE (S2)	
Hellbender	*Cryptobranchus alleganiensis*	PROT (S2)	RARE (S2)	NMGT (S3)
Tennessee cave salamander	*Gyrinophilus palleucus*	PROT (S2)	TRKD(S1)	THR (S2)
Reptiles				
Eastern milk snake	*Lampropeltis triangulum triangulum*	TRKD (S2)	TRKD (S2)	-
Birds				
Bachman's sparrow	*Aimophila aestivalis*	TRKD (S3)	RARE(S3)	END (S2)
Bald eagle	*Haliaeetus leucocephalus*	PROT (S3)	-	NMGT (S3)
Cerulean warbler	*Dendroica cerulea*	TRKD(S1)	TRKD(S3)	NMGT (S3)
Osprey	*Pandion haliaetus*	PROT (S5)	-	-
Peregrine falcon	*Falco peregrinus*	PROT(SH)	END (S1)	END(S1)
Red-cockaded woodpecker	*Picoides borealis*	PROT (S2)	END (S2)	-
Swainson's warbler	*Limnothlypis swainsonii*	TRKD (S3)	TRKD (S3)	NMGT (S3)
Mammals				
Allegheny woodrat	*Neotoma magister*	TRKD (S3)	-	NMGT (S3)
Common shrew	*Sorex cinereus*	-	TRKD(S2)	NMGT (S4)
Eastern big-eared bat	*Corynorhinus rafinesquii*	PROT(S2)	RARE(S3)	NMGT (S3)
Eastern small-footed bat	*Myotis leibii*	TRKD(S1)	TRKD(S2)	NMGT (S2S3)
Gray bat	*Myotis grisescens*	PROT (S2)	END (S1)	END (S2)
Indiana bat	*Myotis sodalis*	PROT (S2)	END (S1)	END (S1)
Invertebrates				
Beetle	*Batriasymmodes spelaeus*	-	-	TRKD (S3)
Blowing cave beetle	*Pseudanophthalmus ventus*	-	-	TRKD (S1)
Nickajack cave beetle	*Pseudanophthalmus nickajackensis*	-	-	TRKD (S1)
Duck River cave beetle	*Pseudanophthalmus tullahoma*	-	-	TRKD (S1)
Nickajack cave isopod	*Caecidotea nickajackensis*	-	-	TRKD (S1)
Spider, a cave-obligate	*Nesticus barri*	TRKD (S3)	-	-

[1]State status: **END** = Endangered; **THR** = Threatened; **TRKD** = Tracked by state Natural Heritage program; **RARE** = Listed Rare by the state; **NMGT** = In Need of Management; **PROT** = State Protected

[2]State ranks: **S1** - critically imperiled; **S2** - imperiled; **S3** - rare or uncommon; **S4** - widespread, abundant and apparently secure; and **S5** - demonstrably widespread, abundant, and secure. **SH**=of historical occurrence, i.e., known to occur in the past, with the expectation that it may be rediscovered.

Class Definitions and Associated Polygon Colors of Sensitive Areas for Right-of-Way Reclearing Sensitive Area Reviews

<table>
<tr><th colspan="4">Terrestrial Plants (A), Terrestrial Animals (D), and Aquatic Animals (E)</th></tr>
<tr><th>Class</th><th>Restriction if Sensitive area in ROW</th><th>Restriction for Sensitive Areas Potentially Affected when <u>Accessing</u> ROW</th><th>Polygon Color</th></tr>
<tr><td>1</td><td>No broadcast spraying. Use one of the three following alternatives: 1) Hand or mechanical clearing, 2) Request field surveys by TVA Heritage staff to determine if suitable habitat for these species exists in the subject area, 3) Selective spraying of herbicides to shrubs or tree saplings less than 12 feet in height.</td><td>Not Applicable</td><td>Yellow</td></tr>
<tr><td>2</td><td>Hand-clearing only. Vehicles and equipment restricted from area unless confined to existing access road.</td><td>Vehicles and equipment restricted from area unless confined to existing access road.</td><td>Red</td></tr>
<tr><td>0</td><td colspan="2">Special circumstance.</td><td>Green</td></tr>
<tr><th colspan="4">Wetlands* (C)</th></tr>
<tr><td>-</td><td colspan="2">Wetlands obtained from National Wetland Inventory data. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.</td><td>Blue Outline</td></tr>
<tr><td>1</td><td colspan="2">Potential wetlands identified by Natural Heritage wetland biologists based on interpretation of topographic features, water bodies, soil surveys and proximity to NWI features. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.</td><td>Pink Outline</td></tr>
<tr><th colspan="4">Natural Areas (B)</th></tr>
<tr><th>Class</th><th>Call**</th><th>Definition</th><th>Color</th></tr>
<tr><td>1</td><td>No</td><td>Same as Class 1 definition above.</td><td>Yellow</td></tr>
<tr><td>2</td><td>No</td><td>Same as Class 2 definition above.</td><td>Red</td></tr>
<tr><td>1</td><td>Yes</td><td>Same as Class 1 definition above, and must contact area manager prior to entering or conducting maintenance in subject area</td><td>Yellow hatching</td></tr>
<tr><td>2</td><td>Yes</td><td>Same as Class 2 definition above, and must contact area manager prior to entering or conducting maintenance in subject area.</td><td>Red hatching</td></tr>
<tr><td>3</td><td>Yes</td><td>Must contact area manager prior to entering or conducting maintenance in subject area.</td><td>Neon Green</td></tr>
<tr><td>none</td><td></td><td>Special circumstance.</td><td>Green</td></tr>
<tr><th colspan="4">Archaeology (F)</th></tr>
<tr><th>Class</th><th>Restriction if Sensitive area in ROW</th><th>Restriction for Sensitive Areas Potentially Affected when <u>Accessing</u> ROW</th><th>Color</th></tr>
<tr><td>1</td><td>Mechanical clearing must be conducted when the ground is dry and firm. If bulldozer is used, blade must be kept above ground surface to avoid ground disturbance. Material from clearing (timber, brush, and large debris) must be removed from sensitive area.</td><td>Vehicles and equipment must be confined to existing access road.</td><td>Yellow</td></tr>
<tr><td>2</td><td>No mechanical clearing. Hand-clearing only (chainsaws may be used but not heavy equipment). Debris from clearing must be hand-carried out of sensitive area.</td><td>All vehicles must be low-pressured tire equipment and must be confined to existing access road.</td><td>Red</td></tr>
</table>

* Refer to Wetlands Statement included in this package.

** The "Call" column on the accompanying datasheets is used by Natural Area specialists only. A blank in the column indicates no call is necessary.

Class Definitions and Associated Polygon Colors of Sensitive Areas for POLE REPLACEMENT Sensitive Area Reviews

All Resources Areas (Plants, Natural Areas, Wetlands, Terrestrial Animals, and Aquatic Animals)		
Class	**Restriction**	**Color**
1	**Botany**: Sensitive Botanical resources are known from the area. Details of proposed activities should be submitted to TVA Heritage staff to determine if the proposed activities require restrictions. **Natural Areas**: Refer to table accompanying project for restrictions. **Wetlands**: Potential wetlands identified by Natural Heritage wetland biologists based on interpretation of topographic features, water bodies, soil surveys and proximity to NWI features. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions. **Terrestrial Animals**: Refer to table accompanying project for restrictions. **Aquatic Animals**: Refer to table accompanying project for restrictions.	Pink
Wetlands		
-	Wetlands obtained from National Wetland Inventory data. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.	Blue Outline
Archaeology		**Color**
Class	**Restriction**	
1	Presence of significant below-ground cultural resources is highly likely. Work must be scheduled when ground is dry and firm. Only vehicles with low-pressured tires may be used within sensitive area. If structure is a pole, new poles must be placed in existing holes; if structure is a tower, existing footings must be used for new tower. If guy wires are used, existing guy wire anchors must be used for new structure. If any of these conditions cannot be met, then details of proposed activities (nature of work, date work is to take place) must be submitted to TVA Cultural Resources staff so that a field review can be scheduled.	Yellow
2	Presence of significant cultural resources is known. Work schedule must be submitted to TVA Cultural Resources staff so that a field review can be scheduled.	Red