**Document Type:** EIS-Administrative Record
**Index Field:** Final EIS
**Project Name:** TVA Bull Run Fossil Plant Landfill Environmental Review
**Project Number:** 2012-33

# BULL RUN FOSSIL PLANT LANDFILL FINAL ENVIRONMENTAL IMPACT STATEMENT

**Anderson County, Tennessee**


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# COVER SHEET

## Bull Run Fossil Plant Landfill

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|---|---|
| **Proposed action:** | The Tennessee Valley Authority (TVA) has prepared this Environmental Impact Statement (EIS) to assess the impacts and address environmental, safety, and socioeconomic concerns associated with the continued disposal of Coal Combustion Residuals (CCR) from the Bull Run Fossil Plant (BRF). TVA will decide which of two alternative CCR storage options will be used to manage CCR produced at BRF. |
| **Type of document:** | Final Environmental Impact Statement |
| **Lead agency:** | Tennessee Valley Authority |
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**Abstract:**

TVA needs to identify additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash and gypsum) produced at BRF. Additional storage capacity would also enable TVA to continue operations at BRF as planned in TVA's Integrated Resource Plan (TVA 2015c), and would be consistent with TVA's voluntary commitment to convert wet CCR management systems to dry systems. In addition to a No-Action alternative which served as a baseline, TVA considered construction of a landfill on TVA property adjacent to BRF and off-site transport of CCR to an existing permitted landfill as potential alternatives for disposal of CCR generated at BRF.

Both of the action alternatives would meet the purpose and need of the project. Construction of an onsite landfill would result in temporary short term impacts during construction and minor long term impacts to aquatic resources, loss of bat habitat and impacts to 2.1 ac of wetland. In addition, the landfill would have a visual impact on surrounding receptors. All of these impacts would be mitigated to reduce adverse effects. Impacts associated with off-site transport of CCR are primarily related to air, noise, dust, transportation, safety and potential Environmental Justice Impacts associated with transportation of CCR on public roadways.

# Executive Summary

This Environmental Impact Statement (EIS) addresses the continued disposal of Coal Combustion Residuals (CCR) from the Bull Run Fossil Plant (BRF). BRF is located in Anderson County, Tennessee, about 5 mi east of downtown Oak Ridge and 13 mi west of Knoxville.

BRF was built between 1962 and 1966, and commercial operation began in June 1967. BRF is the only single-generator coal-fired power plant in the TVA system and has a summer net capability of 863 megawatts. Winter net-dependable generating capacity is about 881 megawatts. BRF generates over 6 billion kilowatt-hours of electric power in a typical year, which is enough electrical energy to meet the needs of approximately 430,000 homes. BRF has state-of-the-art air pollution controls and is one of the coal plants that TVA plans to continue operating in the future as identified in TVA's IRP (TVA 2015c). Historically, TVA has managed storage of CCR materials in ash impoundments or dry landfills. In an effort to modernize the facility and comply with TVA's commitment to manage CCRs on a dry basis, TVA completed the construction of a mechanical dewatering facility at BRF in 2014 to manage bottom ash and gypsum using a dry stack basis. TVA had already been handling and storing fly ash on a dry basis, so there were no changes to that process as a result of the transfer to dry storage. These bottom ash and gypsum materials are disposed on-site at the current Dry Fly Ash Stack located east of the plant.

Based on current estimates of energy production and consumption rates, on-site storage capacity will be expended within 10 years. Therefore, TVA needs to identify additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash and gypsum) produced at BRF. Additional storage capacity would also enable TVA to continue operations at BRF as planned in TVA's IRP (TVA 2015c) and would be consistent with TVA's voluntary commitment to convert wet CCR management systems to dry systems.

## Alternatives Considered

In 2011, TVA performed a siting study to evaluate on-site and off-site alternatives for the construction of a landfill for storage of CCR from BRF which identified eight alternative landfill sites. TVA also identified the off-site transport of CCR to an existing landfill as a potential alternative for management of CCR generated at BRF. The impact of development and/or use of each of these sites were further evaluated against 34 environmental and engineering factors to determine those sites that should be carried over for further analysis in the EIS.

## Alternatives Evaluated in the EIS

In addition to a No-Action alternative which served as a baseline, TVA considered construction of a landfill on property adjacent to BRF and off-site transport of CCR to an existing permitted landfill as potential alternatives for disposal of CCR generated at BRF.

Under Alternative B, TVA would construct and operate a landfill for disposal of CCRs generated at the plant on TVA-owned property located approximately 0.4 mi east of BRF. This site, known as Site J, encompasses 119.9 ac and includes perimeter roads, borrow stockpile and laydown areas and sediment ponds with the landfill footprint of approximately 60 ac. The landfill would provide approximately 15.5 years of disposal capacity based on estimated energy production and consumption rates and would be designed to meet the CCR rule requirements for new landfill development. Development of Site J would also include construction of a dedicated on-site haul road to convey dry CCR from the plant to the landfill.

Under Alternative C, CCR from BRF would be transported to an existing off-site permitted landfill. The analysis of impacts associated with this alternative are based on the closest landfill that can currently accept CCR material. The Chestnut Ridge Landfill is a Class 1 Municipal Solid Waste Facility located approximately 12 mi northeast of BRF. Under this Alternative, CCR generated at BRF would be transported by over-the-road tandem dump trucks on existing roadways to the Chestnut Ridge Landfill for disposal. While barge and rail transport were considered in the Siting Study, they were not considered feasible options for this EIS given the lack of existing infrastructure at BRF and the proximity of Chestnut Ridge to BRF.

**Public and Agency Involvement**

TVA's 33-day scoping period was initiated on May 21, 2015, with the publication in the Federal Register of the Notice of Intent (NOI). The NOI announced that TVA planned to prepare an EIS to address the storage of CCR generated at BRF. In addition to the NOI in the Federal Register, TVA published notices regarding this effort in regional and local newspapers; issued a news release to media; posted the news release on the TVA Web site; and posted flyers and signs near the alternative landfill site to solicit public input.

To initiate scoping, TVA also sent copies of the NOI to the Tennessee Department of Environmental and Conservation (TDEC) and the United States Department of Interior. TVA received six responses on the NOI and one comment form that was submitted by several interested parties. The predominant theme of the comments were related to potential visual, groundwater and cumulative impacts in the EIS. All comments received during the scoping period were considered in determining the alternatives and scope of the analysis.

The Draft EIS was released for comment on May 20, 2016, and a notice of availability, including a request for comments on the Draft EIS, was published in the Federal Register on May 27, 2016. The Draft EIS was posted on TVA's Web site and hard copies were available by request. To solicit public input, the availability of the Draft EIS was announced in regional and local newspapers and a news release was issued to the media and posted to TVA's Web site. In addition, TVA mailed postcard notifications to all residents within a 1-mi radius of the plant (311 addresses). The postcards announced the availability of the EIS and requested comments. The public comment period closed on July 12, 2016. TVA accepted comments that were submitted as late as August 12, 2016.

TVA received 12 comment submissions, which included letters, e-mails and submissions through the project Web site. The comment submissions were carefully reviewed and synthesized into comment statements. The predominant theme of the comments were related to visual impacts, potential air and dust emissions, impacts to land use and groundwater. Comments and TVA's responses can be found in Appendix A of this document.

## Summary of Alternative Impacts

The EIS presents a summary of the impacts of each of the alternatives carried forward for detailed analysis. The environmental impacts of Alternatives A, B and C are summarized in Table 2-5.

**Table ES-1. Comparison of Impacts of Each Alternative by Resource Area**

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| **Air Quality** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in emissions. | Temporary minor impacts during construction from fugitive dust and emissions from equipment and vehicles. | Localized impact due to emissions from increased vehicles used to transport and manage CCR. |
| **Climate Change** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in greenhouse gas (GHG) emissions. | Minor GHG emissions associated with onsite construction equipment. No discernable effect on regional GHG levels. | No impact associated with construction; however, due to increased vehicle miles travelled and use of public roadways, GHG emissions would be higher than Alternative B. |
| **Land Use** | | |
| No impact. | Impact resulting from the conversion of undeveloped land to an industrial facility. Impact to communities adjacent to the landfill would be moderate, but overall impact minor due to previous disturbance and location adjacent to industrial plant. | No impact. |
| **Prime Farmland** | | |
| No impact. | No impact. | No impact. |
| **Geology and Seismology** | | |
| No impact. | Minimal impact. Potential seismic risk mitigated with proper design. | No impact. |
| **Groundwater** | | |
| No impact. | Minimal impact due to incorporation of low permeability synthetic liner and leachate collection and treatment system. Runoff would be controlled with appropriate BMPs. | No impact. |
| **Surface Water** | | |
| No impact. | Minor temporary impacts due to runoff during construction. Direct permanent impacts to the upper reach of Worthington Branch. Mitigated as a result of adherence to permit requirements. | No impact. |

**Table ES-1. Comparison of Impacts of Each Alternative by Resource Area**

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| **Floodplains** | | |
| No impact. | No impact. | No impact. |
| **Vegetation** | | |
| No impact. | Minor impact resulting from the disturbance of a previously disturbed area that lacks notable plant communities. | No impact. |
| **Wildlife** | | |
| No impact. | Minor impact due to loss of previously disturbed habitat. | No impact. |
| **Aquatic Ecology** | | |
| No impact. | Permanent impact to Worthington Branch and aquatic resources due to stream realignment and culverts. However, impacts would be mitigated when the realigned stream channel reestablishes flow regime and habitat. | No impact. |
| **Threatened and Endangered Species** | | |
| No impact. | Minor impact as a result of the loss of bat foraging and roosting habitat. Impact would be mitigated in accordance with ESA requirements. | No impact. |
| **Wetlands** | | |
| No impact. | Direct impact to 2.1 ac of wetland. However, these impacts would be mitigated as required by both state and federal agencies. | No impact. |
| **Solid and Hazardous Waste** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in solid waste produced at BRF. | Minor increase in solid waste generated during construction. Long-term impact associated with the management of solid wastes produced at BRF at Site J as CCR would be disposed in a new landfill. | Long-term impact to the capacity of an existing landfill which limits long-term ability to meet other disposal needs in the region. |
| **Socioeconomic Resources** | | |

**Table ES-1. Comparison of Impacts of Each Alternative by Resource Area**

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in significant adverse effects on local employment and economic measures. | Minor short term increases in employment and, payroll during construction resulting in beneficial direct and indirect economic impacts. Negligible long-term beneficial economic impacts.<br><br>Minor impact to the access to Valley View Church and Church of Christ during construction due to construction related traffic. | Negligible impact due to anticipated minimal employment increase. |
| **Environmental Justice** | | |
| No impact. | Minor to moderate indirect impact to potential EJ community due to increased noise, dust and traffic during construction.<br><br>Landfill would present a visual impact during operation, mitigated by a vegetated buffer. No impact associated with haul of CCR to the landfill. | Moderate impact to potential EJ community due to additional traffic noise and dust associated with transport of CCR. However, this impact would not be disproportionate. |
| **Natural Areas, Parks and Recreation** | | |
| No impact. | Minor indirect impact during construction due to increased vehicles on surrounding roadways.<br>No impact during operation. | Moderate indirect impact to facilities along the haul road during operation. |
| **Transportation** | | |
| No impact. | Minor short-term impact during construction of haul road.<br>No impact during operation. | Moderate impact related to increased traffic and potential increase in crash rates during operation. |
| **Visual Analysis** | | |
| No impact. | The landfill would change the existing visual integrity which would result in a moderate impact to the viewshed of some members of the surrounding community. However, due to the modifications of the landscape from previous development, as well as the adjacent fossil plant, there would be minimal change in overall scenic value. | No impact. |
| **Cultural and Historic Resources** | | |
| No impact. | No impact. | No impact. |
| **Noise** | | |
| No impact. | Minor impact. | Moderate impact. |
| **Public Health and Safety** | | |

**Table ES-1. Comparison of Impacts of Each Alternative by Resource Area**

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| No impact | Worker and public health and safety during construction and operation would be maintained and any impact would be minor. | Increased traffic would increase the potential risk of injuries and fatalities associated with truck crashes. |
| **Cumulative Effects** | | |
| No impact. | Minimal impact to overall scenic value. | Minor to moderate impact to transportation. |

## Preferred Alternative

TVA has identified Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J) as the preferred alternative. Alternative C, would result in few impacts to the natural environment associated with construction of a landfill, because it would utilize an existing, permitted landfill. However, Alternative C would also require the offsite transport of CCR. Transport of CCR would occur daily (during a typical five-day work week) over an approximate 15-year period. Alternative B is preferred because it would achieve the purpose and need of the project, the environmental impact of constructing a new, on-site landfill would be minor and/or temporary, and the location would avoid the off-site transport of CCR along public roads, as well as the air emissions, noise emissions, long-term safety risks and disruptions to the public that would be associated with the long-term off-site transport of CCR along public roadways.

## Mitigation Measures

Mitigation measures designed to minimize or reduce adverse impacts associated with implementation of Alternative B include:

- Due to the loss of potentially suitable foraging and roosting habitat for endangered bat species, Section 7 consultation with U.S. Fish and Wildlife (USFWS) will be required. Given the occurrence of potentially suitable roosting habitat for some endangered bat species, all tree clearing would be limited to those times of the year when bats are not expected to be roosting in the area (October 1 through March 31). Impact to bat habitat would be mitigated in accordance with ESA requirements.
- TVA has coordinated with Tennessee Department of Environmental Conservation (TDEC) and U.S. Army Corps of Engineers (USACE) and has proposed mitigation for those areas impacted by relocation and/or encroachment of Worthington Branch through payment to an appropriate stream bank and/or restoration on-site.
- Actions involving wetlands and/or stream crossings and stream alterations would be subject to requirements outlined in the federal Clean Water Act Section 404 permit

and the TDEC Aquatic Resources Alteration Permit (ARAP). TVA would adhere to all conditions stipulated in these permits

- TVA will maintain the plantings along the portion of Site J adjacent to Old Edgemoor Road to continue to provide a vegetative screen.
- TVA will develop a fugitive dust plan which identifies adequate dust control measures for this site. As per CCR rule requirements, TVA has developed a fugitive dust hotline where concerns regarding fugitive dust can be recorded. Every year TVA will prepare a report detailing the dust controls used, any citizen complaints received, and a summary of any corrective actions taken.
- TVA will implement a groundwater monitoring plan that adheres to the requirements established in the CCR Rule and those established by TDEC.

In addition, TVA has identified the following Best Management Practices (BMPs) that will be employed to minimize impacts:

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and other appropriate BMPs (Clean Air Act [CAA] Title V operating permit incorporates fugitive dust management conditions).
- Erosion and sedimentation control BMPs (e.g., silt fences) would reduce the potential for erosion of soil minimizing the potential for impact to surface waters during construction.
- Consistent with Executive Order 13112, disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- TVA would implement operational mitigations to reduce potential surface water impacts from CCR operations, such as requiring that no more than 10 ac of ash be exposed at any one time.
- A Storm Water Pollution Prevention Plan will be created to limit the size of the disturbed areas and to divert storm water runoff away from construction areas into existing ponds.
- Construction debris and excess materials will be disposed of properly.
- TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted.
- Proper spill prevention measures will be taken to reduce the potential for spills of fuel//lube/insulation oil.
- Subcontractor and prime contractor employees would require Occupational Safety and Health Administration (OSHA) 1910.120 training.

# TABLE OF CONTENTS

## LIST OF APPENDICES



## LIST OF TABLES

## LIST OF FIGURES

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# SYMBOLS, ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **AADT** | Average Annual Daily Traffic |
| **APE** | Area of Potential Effect |
| **ARAP** | Aquatic Resources Alteration Permit |
| **BMP** | Best Management Practice |
| **BRF** | Bull Run Fossil Plant |
| **CAA** | Clean Air Act |
| **Cc** | Conasauga Group |
| **CCR** | Coal Combustion Residuals |
| **CEQ** | Council on Environmental Quality |
| **CFR** | Code of Federal Regulations |
| **cfs** | Cubic Feet per Second |
| **$CO_2$** | Carbon Dioxide |
| **$CO_3$** | Carbonate |
| **CRM** | Clinch River Mile |
| **CWA** | Clean Water Act |
| **dB** | Decibel |
| **dBA** | A-Weighted Decibel |
| **DO** | Dissolved Oxygen |
| **EA** | Environmental Assessment |
| **EIS** | Environmental Impact Statement |
| **EJ** | Environmental Justice |
| **EO** | Executive Order |
| **EPCRA** | Emergency Planning and Community Right to Know Act |
| **ESA** | Endangered Species Act |
| **ETSZ** | East Tennessee Seismic Zone |
| **FGD** | Flue Gas Desulfurization |
| **ft msl** | Feet Above Mean Sea Level |
| **g** | Gravitational Pull |
| **GHG** | greenhouse gases |
| **GIS** | Geographic Information System |
| **HPA** | Habitat Protection Area |
| **Hz** | Hertz |
| **HUD** | U.S. Department of Housing and Urban Development |
| **Ldn** | Day-Night Sound Level |
| **Leq** | Equivalent Sound Level |
| **LOS** | Level of Service |
| **MGD** | Million Gallons per Day |
| **NAAQS** | National Ambient Air Quality Standards |
| **NEPA** | National Environmental Policy Act |
| **NHPA** | National Historic Preservation Act |
| **NMGT** | Listed in Need of Management |
| **NMSZ** | New Madrid Seismic Zone |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **NOI** | Notice of Intent |
| **$NO_x$** | Nitrogen Oxides |
| **$NO_2$** | Nitrogen Dioxide |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NRHP** | National Register of Historic Places |
| **OSHA** | Occupational Safety and Health Administration |
| **PCB** | Polychlorinated Biphenyls |
| **PGA** | Peak Ground Acceleration |
| **$PM_{2.5}$** | Particulate matter whose particles are less than or equal to 10 micrometers |
| **$PM_{10}$** | Particulate matter whose particles are less than or equal to 10 micrometers (PM10) |

| | |
|---|---|
| **RCRA** | Resource Conservation and Recovery Act |
| **SASZ** | Southern Appalachia Seismic Zone |
| **SCSZ** | South Carolina Seismic Zone |
| **SHPO** | State Historic Preservation Officer |
| **$SO_2$** | Sulfur Dioxide |
| **TCA** | Tennessee Code Annotated |
| **TDEC** | Tennessee Department of Environment and Conservation |
| **TMDL** | Total Maximum Daily Load |
| **TVA** | Tennessee Valley Authority |
| **USACE** | U.S. Army Corps of Engineers |
| **USFWS** | U.S. Fish and Wildlife Service |
| **USC** | United Stated Code |
| **USCB** | U.S. Census Bureau |
| **USGS** | U.S. Geological Survey |
| **VOC** | Volatile Organic Compounds |
| **WOUS** | Waters of the United States |

# CHAPTER 1 – PURPOSE AND NEED FOR ACTION

## 1.1 Introduction and Background

The Bull Run Fossil Plant (BRF) is located in Anderson County, Tennessee, about 5 mi east of downtown Oak Ridge and 13 mi west of Knoxville (Figure 1-1). BRF is operated by Tennessee Valley Authority (TVA) and is located on a 750-ac reservation on the east side of Melton Hill Reservoir at Clinch River Mile (CRM) 48. The plant adjoins Edgemoor Road and Raccoon Valley Road (both of which represent SR 170) between U.S. Highway 25 (Clinton Highway) and SR 162 (Pellissippi Parkway). Most nearby lands (southwest) are U.S. Department of Energy reservation properties for that agency's Oak Ridge facilities. Most surrounding lands are developed for residential and rural residential land uses.

BRF was built between 1962 and 1966, and commercial operation began in June 1967. BRF is the only single-generator coal-fired power plant in the TVA system and has a summer net capability of 863 megawatts. Winter net-dependable generating capacity is about 881 megawatts. BRF generates over 6 billion kilowatt-hours of electric power in a typical year, which is enough electrical energy to meet the needs of approximately 430,000 homes.

When operating at full capacity, BRF produces approximately 240,000 tons per year of ash (bottom and fly ash) and 318,000 tons per year of gypsum for a total of approximately 560,000 tons of coal combustion residuals (CCR) per year. Historically, TVA has managed storage of CCR materials in ash impoundments or dry landfills. In an effort to modernize the facility and comply with TVA's commitment to manage CCRs on a dry basis, TVA completed the construction of a mechanical dewatering facility at BRF in 2014 to manage bottom ash and gypsum using a dry stack basis (TVA 2012). These materials are disposed on-site at the current Dry Fly Ash Stack located east of the plant (see Figure 1-1). TVA had already been handling and storing fly ash on a dry basis, so there were no changes to that process as a result of the transfer to dry storage.

## 1.2 Purpose and Need

BRF has state-of-the-art air pollution controls and was identified in TVA's 2015 Integrated Resource Plan (TVA 2015c), as one of the coal plants that TVA plans to continue operating in the future. TVA needs 20-years of disposal capacity to meet this operational timeline. Based on current estimates of energy production and consumption rates, on-site storage capacity will be expended within 10 years. Therefore, TVA needs to identify additional storage capacity for the long-term disposal (at least 10 years, based on current production and consumption rates) of the dry CCR materials (fly ash, bottom ash and gypsum) produced at BRF. Additional storage capacity would also enable TVA to continue operations at BRF as planned and would be consistent with TVA's voluntary commitment to convert wet CCR management systems to dry systems.

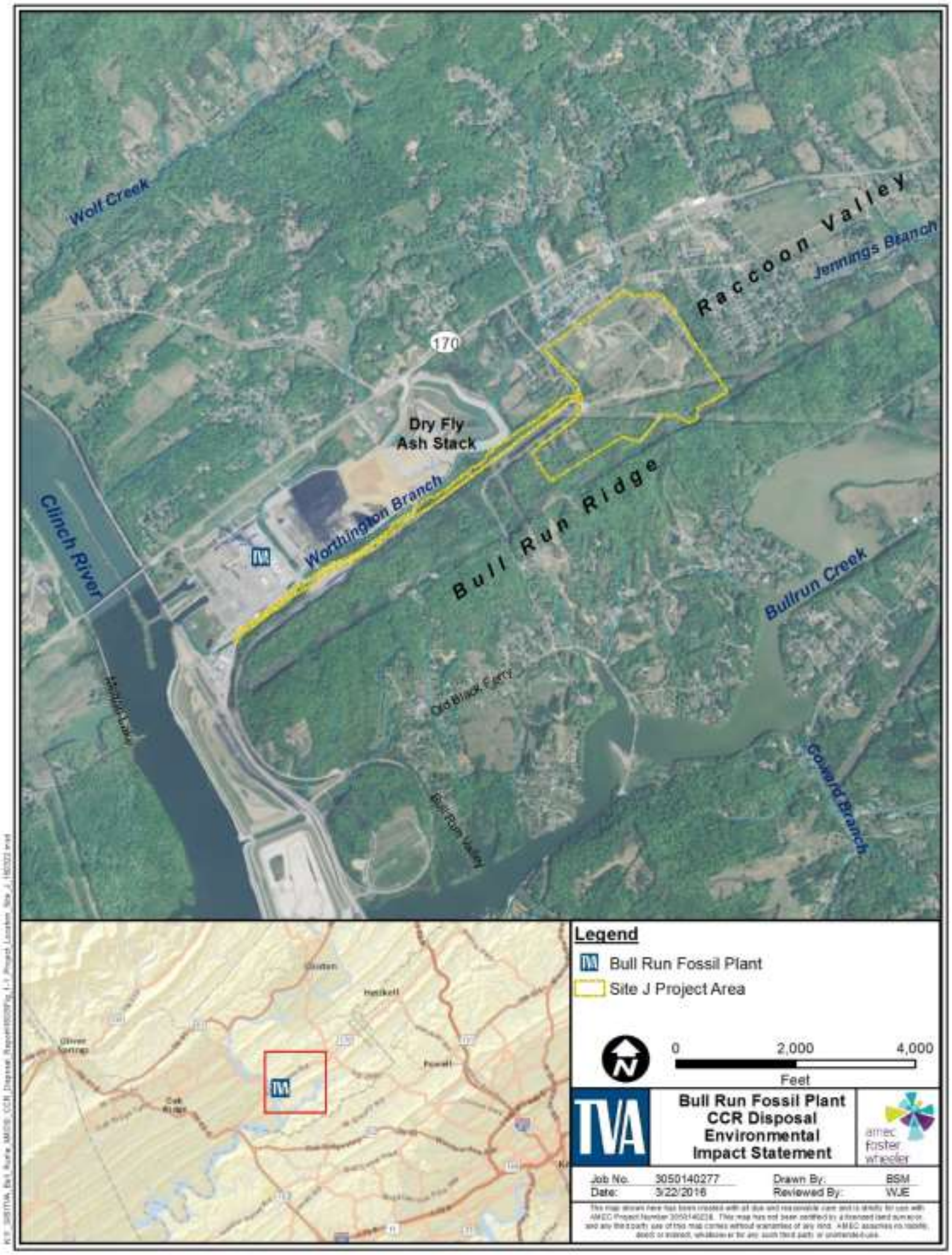


**Figure 1-1. Location of Bull Run Fossil Plant and the Proposed Landfill Site Study Area**

## 1.3 Decision to be Made

In 2009, TVA outlined a plan to eliminate wet storage of CCR at all coal-combustion power plants. Given the current limited capacity for dry storage of CCR at BRF, TVA needs to identify additional capacity for the long-term management of dry CCR materials produced at BRF. Specifically, TVA needs to decide whether to provide on-site storage capacity through the construction of a CCR landfill or to transport CCR off-site to an existing permitted facility. After identifying reasonable alternatives to address this need, TVA must decide whether the alternatives would cause significant impacts to the environment and which alternative is the preferred alternative for the agency. TVA's decision will consider factors such as environmental impacts, economic issues, availability of resources and TVA's long-term goals. This Environmental Impact Statement (EIS) is prepared to support the decision making process.

## 1.4 Related Environmental Reviews and Consultation Requirements

The following environmental reviews have been prepared for actions related to CCR management at BRF:

- *Ash Impoundment Closure Environmental Impact Statement* (TVA 2016). The EIS was prepared to address the closure of CCR impoundments at all of TVA's coal-fired power plants. The report consists of two parts: Part I – Programmatic National Environmental Policy Act (NEPA) Review and Part II – Site-Specific NEPA Review. In Part I, TVA programmatically considered environmental effects of closure of ash impoundments using two primary closure methods: (1) Closure-in-Place and (2) Closure-by-Removal. Conclusions reached from the programmatic analysis are generally applicable to any CCR ash impoundment in the TVA system. Part II is an integrated analysis of ten site-specific ash impoundment closures including the ash impoundments at BRF.
- *Integrated Resource Plan, 2015 Final Report* (TVA 2015c). This plan provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. This document and the associated Supplemental Environmental Impact Statement evaluate scenarios that could unfold over the next 20 years. It discusses ways that TVA can meet future power demand economically while supporting TVA's equally important mandates for environmental stewardship and economic development across the Tennessee Valley. The report indicated that a diverse portfolio is the best way to deliver low-cost, reliable electricity. TVA released the accompanying Final Supplemental Environmental Impact Statement for TVA's Integrated Resource Plan in July 2015 (TVA 2015d).
- *Bull Run Fossil Plant House Demolition and Hydrogeologic Investigations Environmental Assessment* (TVA 2013). Prior to this Environmental Assessment (EA), TVA purchased approximately 166 ac adjacent to BRF. To protect public health and safety, TVA proposed to remove structures and implement other actions to manage the acquired land. TVA performed a hydrogeologic investigation to determine potential future uses of the property, including construction and operation of a CCR landfill.
- *Bottom Ash and Gypsum Mechanical Dewatering Facility Bull Run Fossil Plant, Final EA* (TVA 2012). This EA evaluated the installation of equipment to remove water from gypsum and bottom ash generated at BRF. The dewatering equipment allows TVA to convert its bottom ash and gypsum handling processes to a dry system.

- *Installation of Flue Gas Desulfurization System at Bull Run Fossil Plant, Final EA* (TVA 2005). This EA evaluated the impacts of construction and operation of flue gas desulfurization or scrubber equipment designed to reduce sulfur dioxide emissions

## 1.5 Identification of Project Scope

TVA prepared this EIS to comply with the NEPA and regulations promulgated by the Council on Environmental Quality (CEQ) and TVA's procedures for implementing NEPA. The EIS will investigate the management of CCRs generated at BRF including the design, construction and operation of a new landfill, hauling to an existing permitted landfill, or taking No Action.

TVA has determined the resources listed below are potentially impacted by the alternatives considered. These resources were identified based on internal scoping as well as comments received during the scoping period.

- Air Quality
- Climate Change
- Land Use
- Prime Farmland
- Geology and Seismology
- Groundwater
- Surface Water
- Floodplains
- Vegetation
- Wildlife
- Aquatic Ecology
- Threatened and Endangered Species
- Wetlands
- Socioeconomics and Environmental Justice
- Natural Areas, Parks and Recreation
- Transportation
- Visual Resources
- Cultural and Historic Resources
- Noise
- Solid Waste and Hazardous Waste
- Public Health and Safety

TVA's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplains Management), EO 13112 (Invasive Species), EO 13653 (Preparing the United States for the Impacts of Climate Change), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice) and applicable laws including the National Historic Preservation Act, Endangered Species Act (ESA), Clean Water Act (CWA) and Clean Air Act (CAA).

## 1.6 Scoping and Public Involvement

TVA provided multiple opportunities for meaningful involvement to members of the community throughout the NEPA process including meetings with local officials, public scoping and public review of the Draft EIS.

Prior to the initiation of the public scoping process, TVA conducted a lunch and learn in April 2015 to introduce the project to local officials.

During the scoping period for this EIS, TVA published a Notice of Intent (NOI); sent notifications to a range of federal, state and local agencies; established a project Web site (https://www.tva.gov/); and provided a number of means for the public to provide comments verbally, in writing and by phone message. In addition, TVA issued a news release to the media, posted the news release on the TVA website; and posted flyers and signs near the proposed landfill site to solicit public input.

The Draft EIS was released for comment on May 20, 2016, and a notice of availability including a request for comments on the Draft EIS, was published in the Federal Register on May 27, 2016. TVA's public and agency involvement for this Draft EIS included a public notice and a 45-day public review of the Draft EIS. The Draft EIS was posted on TVA's Web site and hard copies were available by request. To solicit public input, the availability of the Draft EIS was announced in regional and local newspapers and a news release was issued to the media and posted to TVA's Web site. In addition, TVA mailed postcard notifications to all residents within a 1-mi radius of the plant (311 addresses). The postcards announced the availability of the EIS and requested comments. The public comment period closed on July 12, 2016. TVA accepted comments that were submitted as late as August 12, 2016.

TVA received 12 comment submissions, which included letters, e-mails and submissions through the project Web site. The comment submissions were carefully reviewed and synthesized into comment statements. These comments and TVA's responses are provided in Appendix A.

TVA's agency involvement included sending letters to local, state and federal agencies and federally recognized tribes to notify them of the availability of the Draft EIS. A list of agencies and tribes notified of the availability of the Draft EIS is provided in Chapter 6.

In response to comments received from the public, agencies and other interested parties, TVA has made revisions to the Draft EIS and issued this Final EIS. TVA will not make final decisions any earlier than 30 days after the Notice of Availability of the Final EIS is published in the Federal Register.

### 1.6.1 Notice of Intent

TVA's 33-day scoping period was initiated on May 21, 2015, with the publication in the Federal Register of the NOI. The NOI announced that TVA planned to prepare an EIS to address the storage of CCR generated at BRF. In addition to the NOI in the Federal Register, TVA published notices regarding this effort in regional and local newspapers; issued a news release to media; posted the news release on the TVA Web site; and posted flyers and signs near the alternative landfill site to solicit public input.

To initiate scoping, TVA also sent copies of the NOI to the Tennessee Department of Environmental and Conservation (TDEC) and the United States Department of Interior.

### 1.6.2 Scoping Feedback

TVA received six responses during the scoping period. The majority of the comments focused on specific resources that should be considered in the EIS including:

- Wastewater treatment requirements and potential impacts associated with EPA Effluent Limitations Guidelines.
- Beneficial reuse of gypsum.
- Impacts to wildlife near BRF.
- Potential visual impacts.

One comment form was submitted by several interested parties and included the following:

- A request that TVA modify the Purpose and Need and consider the retirement of BRF as a reasonable alternative.
- TVA should consider cumulative impacts.

- TVA should evaluate groundwater impacts.
- TVA should evaluate the impacts of coal ash at BRF.
- TVA should characterize existing coal ash at BRF.
- TVA should consider the CCR Rule when making current and future coal ash disposal recommendations.

A copy of the scoping report is provided in Appendix B.

## 1.7 Required Permits and Licenses

Depending on the decisions made respecting the proposed actions, TVA may need to obtain or seek amendments to the following permits:

- National Pollutant Discharge Elimination System (NPDES) permit for land disturbance and storm water runoff from construction activities.
- Air permitting regulations under the CAA require TVA to secure an Air Pollution Control Permit to Construct prior to the commencement of the proposed construction. The project would likely require revisions to TVA's Title V Permit under the CAA for operations.
- Modification of existing NPDES permits due to changes to discharges during operation of the landfill.
- Actions involving wetlands and/or stream crossings would be subject to federal CWA Section 404 permit requirements. In addition, a TDEC Aquatic Resources Alteration Permit (ARAP) certification may be required for the proposed stream location on site J.
- Update the existing multi-sector permit to include two new industrial storm water (non CCR contact) outfalls.
- TVA will obtain a Solid Waste Class II Disposal Permit from TDEC.

Necessary permits will be evaluated based on site-specific conditions.

# CHAPTER 2 – ALTERNATIVES

This chapter describes the alternatives TVA considered to address the project needs. TVA considered both alternative sites for the disposal of CCR materials from BRF and the mode of transport of those materials.

## 2.1 Siting Alternatives

### 2.1.1 Prior Siting Study

In 2011, TVA performed a Siting Study to evaluate suitable sites for constructing a landfill to manage CCR produced at BRF. The goal of the study was to identify a single, primary site that is technically and economically viable for construction of a dry CCR landfill and minimizes impacts to the surrounding community and environment (URS 2011). The initial step of the study (Step 1A) incorporated several tasks, including establishment of the limits of the study area based on TVA input, identification of exclusionary criteria and the establishment of potential candidate areas based on a screening level evaluation. During Step 1A, area screening and geographic information system (GIS) analysis was performed resulting in the development of an exclusionary criteria map. Exclusionary criteria included 100-year floodplains, proximity to major water bodies and surrounding land uses. Other criteria included consideration of the potential mode of transportation (i.e. barge, rail or truck) and transportation-related effects, potential impacts to wildlife and potential impacts to groundwater. The second step established a “score” for each candidate area that allowed for the direct comparison of the potential areas (Step 1B). A total of nine areas were considered (Sites A through I). At the completion of Step 1, seven off-site candidate landfill alternatives (Sites A, C, D, E, G, H, I) and three on-site alternatives (Site J, Borrow Area, Rail Loop) were identified for further evaluation (Figure 2-1). Sites B and F were eliminated from further consideration at this stage due to land use, size and geological considerations.

A portion of the Rail Loop area would require construction overlying an existing ash dredge cell that has been accepted as closed by the state of Tennessee. Additionally the steep topography presents construction and operational concerns. In addition, the Rail Loop Site lacked adequate volume. The Borrow Area site was large enough to provide adequate volume, but would be limited due to steep terrain. Additionally, this area drains to an existing wetland, and development of the site would result in potential environmental impacts to this resource. Both the Rail Loop site and the existing Borrow Area also would be very visible to the public with both sites being constructed on areas of higher elevation than the surrounding land with minimal natural screening. For these reasons, these two on-site alternatives were considered not feasible and were eliminated from further consideration.

### 2.1.2 Sites Retained for Alternative Analysis

Subsequent to the identification of the eight alternative landfill sites carried forward from the prior Siting Study, TVA identified the off-site transport of CCR to an existing landfill as a potential alternative for management of CCR generated at BRF. The Chestnut Ridge Landfill is the nearest Resource Conservation and Recovery Act (RCRA) Subtitle D landfill to BRF; therefore, this location was added to the analysis to represent this alternative. The resulting candidate sites selected are shown on Figure 2-2 and summarized in Table 2-1.

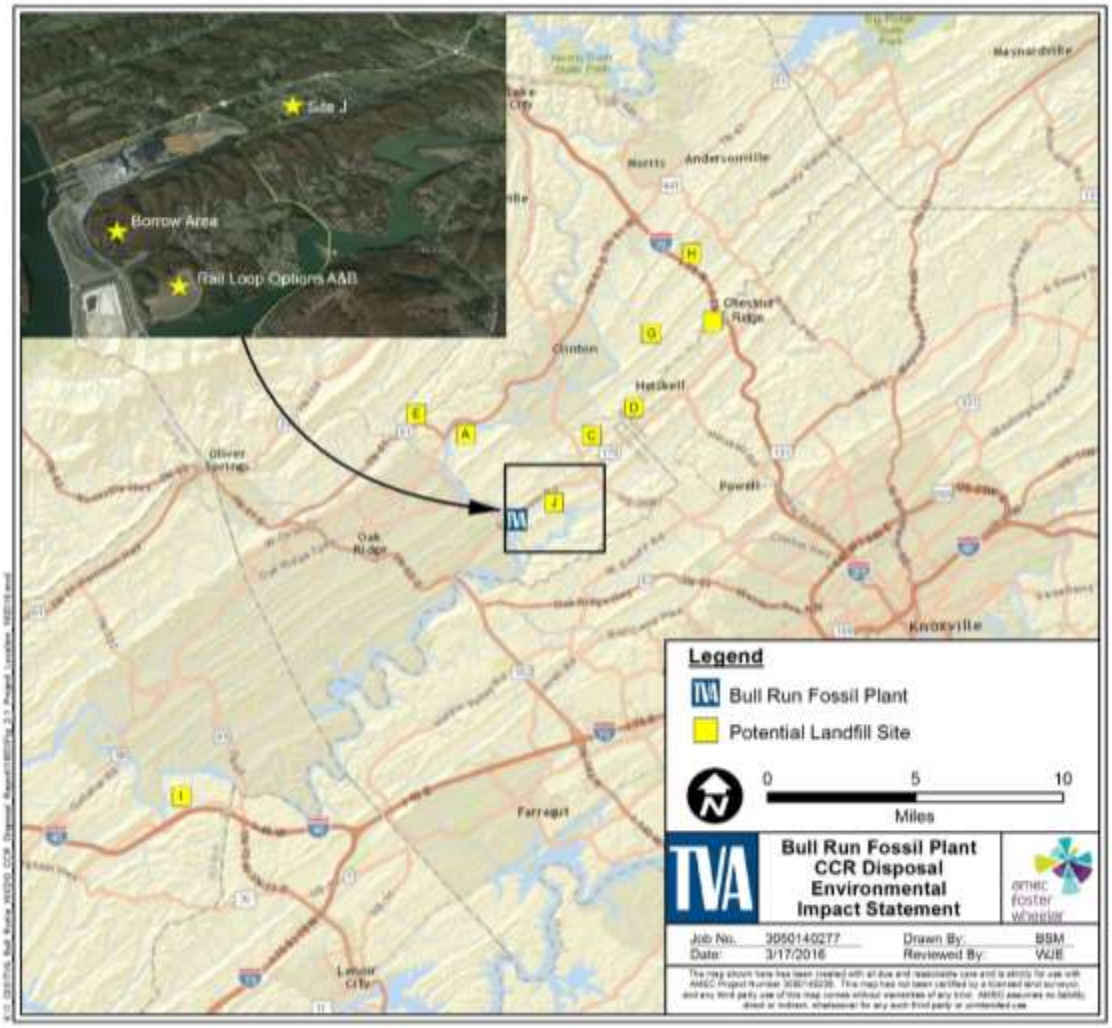


**Figure 2-1. Alternative Sites Considered in Prior Siting Study**

**Table 2-1. Summary of Alternative CCR Disposal Sites Retained for Analysis**

| Site Name | Driving Distance from BRF (mi) | Approximate Landfill Acreage | Estimated Capacity (Million $yd^3$) | Estimated Life span (Years) |
|---|---|---|---|---|
| A | 4.5 | 120 | 14.2 | 28 |
| C | 4.6 | 116 | 19.0 | 38 |
| D | 6.0 | 108 | 12.1 | 24 |
| E | 7.5 | 112 | 13.1 | 26 |
| G | 9.3 | 110 | 16.1 | 32 |
| H | 14.5 | 112 | 16.7 | 33 |
| I | 26.2 | 120 | 21.3 | 42 |
| J | 0.4 | 54 | 6.6 | 12[1] |
| Chestnut Ridge | 12.0 | 166 | | 40+ |

Source: URS 2012a.

[1] Estimate is based upon production levels at the time the siting study was completed. This estimate has been refined based on additional data and production levels.

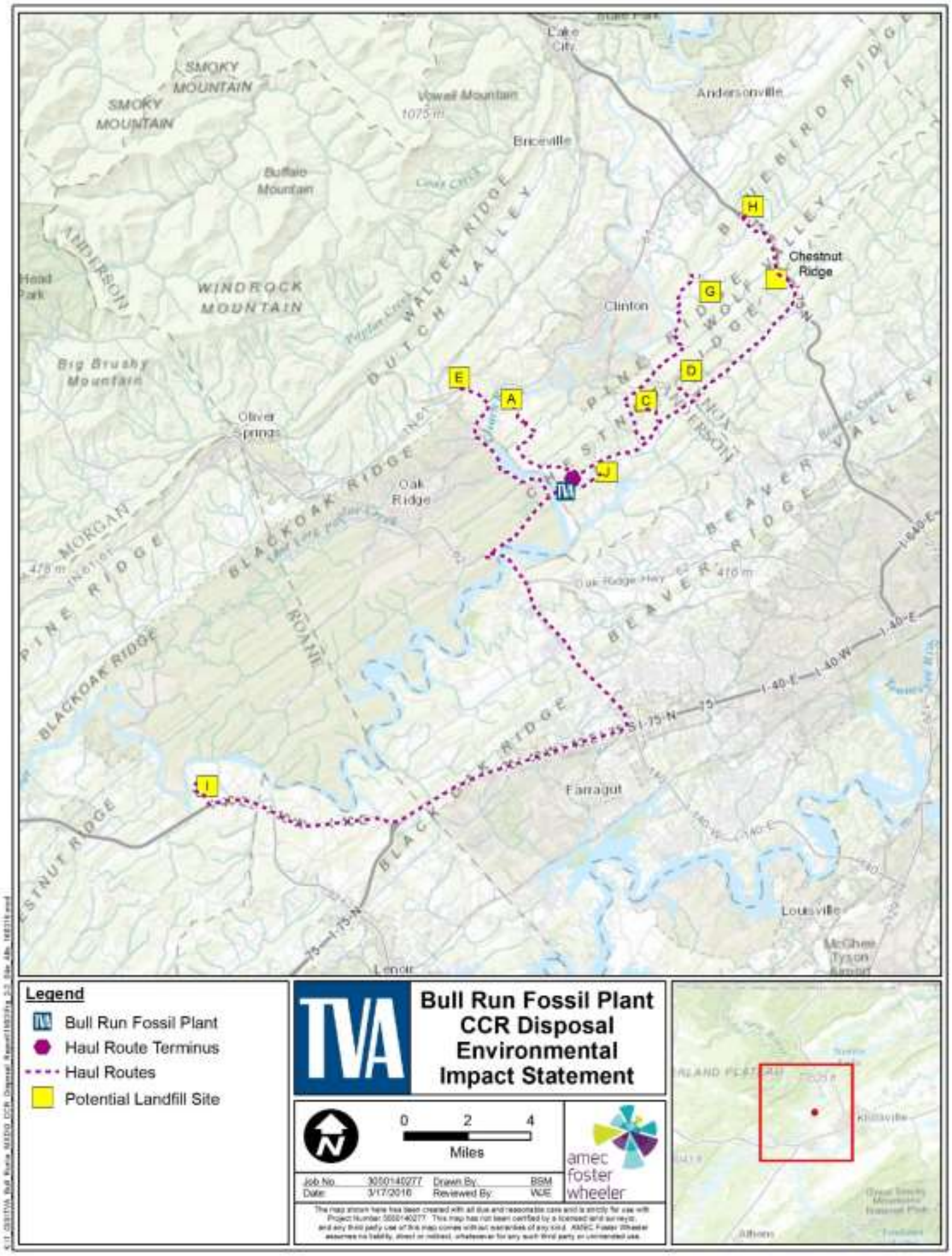


**Figure 2-2. Study Area for the Alternative CCR Disposal Sites Retained for Analysis**

The impact of development and/or use of each of these sites were further evaluated against resource factors related to a total of 34 environmental and engineering factors in four general categories: (1) Natural Environment; (2) Geology; (3) Human Environment; and (4) Engineering and Transportation Considerations. The purpose of this evaluation was to determine the sites that should be carried over for further analysis in the EIS. The evaluation consisted of a two-step process that entailed the compilation of quantitative constraint information for each of the alternatives followed by a qualitative rank scoring process.

Factors considered as part of the impact of each of the alternative sites to the natural and human environment included:

- Streams
- Wetlands
- Sensitive Species
- Prime Farmland
- Displacements
- Public/Semi-Public Lands
- Environmental Justice
- Parks and Natural Areas
- Vegetation/Wildlife
- Air Quality
- Land Use
- Property Ownership
- Cultural Resources
- Economic Impacts
- Noise
- Hazardous Waste
- Visual Environment
- Zoning
- Farmland Impacts
- Community Cohesion

Geologic constraints considered as they related to development of each of the alternative sites included:

- Karst Conduit Potential
- Geologic Stability
- Sinkholes and Caves
- Groundwater Resources
- Seismic Zones
- Mines and Mineral Resources

Engineering feasibility and transportation factors considered for each of the alternative sites included:

- Site Capacity
- Slope/Soil Stability
- Distance to BRF
- Traffic Operations
- Potential for Rail Transport
- Potential for Barge Transport
- Transportation Cost
- Availability of Cover Soil On-Site

Each of the resource factors was evaluated using professional judgment that synthesized the quantitative constraint data to determine relative impact for the purposes of ranking each alternative landfill site. Considerations of the magnitude of potential impact and significance based on resource sensitivity and context were used to develop an appropriate range of rank scores applied to the alternatives under review for each resource category, with higher scores representing greater impact. For example, for impacts to stream resources, the scoring used a full range of values (one to five) to appropriately reflect the range of potential impact (0 to approximately 3,200 ft) and the importance of this resource as it relates to the considerations of significance (based on permit type [Nationwide vs. Individual Section 404 permit], and the burden to demonstrate maximum avoidance and minimization under provisions of Clean Water Act Section 404(b)(1). In contrast, the magnitude of impact to prime farmland for each of the sites ranged from zero to approximately 48 ac. However, because this range is not expected to exceed significance thresholds, the rank scoring adopted a range of one to three to appropriately reflect both magnitude and relative importance of impact.

This process is described in detail in the Alternatives Analysis in Appendix B, and the results are summarized in Table 2-2.

**Table 2-2. Score of Alternative CCR Disposal Sites**

| Evaluation Criteria | New Landfill Sites | | | | | | | | Chestnut Ridge |
|---|---|---|---|---|---|---|---|---|---|
| | **A** | **C** | **D** | **E** | **G** | **H** | **I** | **J** | |
| Natural Environment | 21 | 22 | 23 | 18 | 23 | 24 | 24 | 20 | 17 |
| Geology | 13 | 9 | 11 | 13 | 7 | 8 | 7 | 7 | 6 |
| Human Environment | 28 | 26 | 28 | 24 | 26 | 25 | 21 | 23 | 16 |
| Engineering/ Transportation | 12 | 12 | 10 | 13 | 14 | 16 | 17 | 9 | 13 |
| Total | **74** | **69** | **72** | **68** | **70** | **73** | **69** | **59** | **52** |

Note: Based on the analysis presented in Appendix B. Lower scores are more desirable.

Alternative Site A was determined to have a relatively high impact on social and economic factors including land use and potential Environmental Justice (EJ) issues. In addition, this site would have a high relative impact to geologic and human environment factors. Therefore, this site was eliminated from further study.

Alternative Site C had relatively high impacts on natural and human environment factors including air quality and land use. Geologic limitations included a relatively higher karst conduit potential and percentage of highly erodible soils within the site area. Therefore, this site was eliminated from further study.

Alternative Site D had relatively high impacts to air quality and noise due to the high number of residents near the site and along the haul route. This site also presented geologic concerns associated with karst conduit potential and the high percentage of highly erodible soils within the site area. Overall, this site was ranked as being relatively unfavorable due to geology and relatively high impacts to the human environment. For these reasons, this site was eliminated from further study.

Alternative Site E had relatively high impacts associated with geologic constraints, largely driven by its karst conduit potential and the presence of a sinkhole within the site area. Additionally, this site is predominately covered in farmland and had the greatest impact on farm operations. Although the rank score for this site was similar to Site C, this is the only site with a sinkhole located within the proposed landfill boundary. Additionally, the transport of CCR to this landfill would require a left turn out of BRF to merge into traffic crossing the Clinch River Bridge which results in safety concerns and increased transportation costs of the project due to congestion across the bridge that is experienced during peak periods. Therefore, this site was eliminated from further study.

Alternative Site G had a relatively low score for geological considerations, but had relatively high impacts to the natural environment, especially streams and sensitive noise receptors. This site would also have the potential for EJ impacts and the haul route could impact a relatively high number of adjacent residential receptors. In addition, approximately 3.5 mi of the haul route to Site G incorporated a two-lane roadway with little or no shoulder, which presented a potential safety issue. For these reasons, this site was eliminated from further study.

Alternative Site H had relatively high potential impact to the natural environment and had little benefit from an engineering and transportation perspective. The site is located relatively far away from BRF, and there were more residential receptors that could potentially be impacted along the haul road. Additionally, the current land cover at the site was almost all forested with a stream and as such, the site would have relatively high impacts to natural resources. For these reasons, this site was eliminated from further study.

Alternative Site I had relatively low scores for geologic considerations and impacts to the human environment; however, there were a relatively higher number of impacts to the natural environment due to the stream and wetland located within the site. While this site is located the furthest away from BRF, most of the haul route would be located along the interstate; therefore, there were fewer residential receptors along the haul route. Additionally, there was a relatively small number of displacements associated with this site. However, transport of CCR to this site would require a left turn out of BRF to merge into traffic crossing the Clinch River Bridge. This turn, coupled with the distance from BRF, resulted in safety concerns and increased transportation costs. Therefore, this site was eliminated from further study.

The Chestnut Ridge Landfill is an existing, permitted landfill that has sufficient capacity to meet the need for long-term storage of CCR generated at BRF. There would be no new impacts to the natural environment associated with landfill construction. The primary impacts identified in the screening analysis were related to the cost and impacts associated with transportation of CCR from BRF to the site. Chestnut Ridge is located between 10 and 14 mi from BRF, which results in a relatively moderate transportation cost. However, because Chestnut Ridge is a privately-owned landfill, tipping fees would also contribute to the cost of this alternative. As stated in the Appendix C, these fees would significantly increase the cost of this alternative. Tipping fees have been estimated at approximately $75 per ton of ash, which at the estimated the disposal rate of 1,530 tons per day (see Table 3-7) would equal roughly $114,750 dollars per day or over $41 million dollars per year. Impacts associated with transport of CCR along public roads are related to air, noise and dust emissions during transport and the potential public safety impacts associated with additional trucks on surrounding roadways. Therefore, this site was retained for more detailed analysis.

Alternative Site J contained an on-site private haul road and is located on TVA-owned property adjacent to BRF; as such this alternative had no impacts associated with the transport of CCR on public roadways. Use of this site, in conjunction with existing on-site storage capacity at BRF would meet the need for long-term storage of CCR from BRF. The site had favorable geologic conditions and development and operation of the landfill would result in relatively low impacts on the natural environment. However, the site is relatively close to existing residential developments and may result in some potential, but mitigable impacts to EJ populations. Therefore, this site was retained for more detailed analysis.

## 2.2 Alternatives Retained for Detailed Analysis

Based on the extensive analysis of both on-site and off-site disposal options, TVA retained the following alternatives for detailed evaluation in this EIS:

- Alternative A – No Action
- Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)
- Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

### 2.2.1 Alternative A – No Action

Applicable NEPA regulations require federal agencies to consider a No Action Alternative. Under the No Action Alternative, TVA would not seek additional disposal options for dry placement of CCR generated at BRF. Rather, CCR would continue to be stored in the current disposal areas for as long as storage capacity is available. Since there is limited capacity for additional CCR disposal on-site, at some point in the future, capacity to store CCR on-site will become a limiting factor for continued BRF operations. TVA's 2015 Integrated Resource Plan (TVA 2015c) identifies BRF as a facility that will continue to operate as part of its balanced portfolio of energy resources. BRF has also been designated as a base load facility. As such, any limit on future operations of BRF would not comply with TVA's plan to operate BRF as a base load facility nor conform to TVA's long range plan to provide power to meet future demands through 2033 as outlined in the Integrated Resource Plan. Therefore, this alternative would not meet the Purpose and Need for the proposed action and, therefore, is not considered viable or reasonable. It does, however, provide a benchmark for comparing the environmental impacts of implementation of Alternatives B and C.

### 2.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this alternative, TVA would construct and operate a landfill for disposal of dry CCRs generated at the plant on TVA-owned property located approximately 0.4 mi east of BRF (Figure 2-3). This site, known as Site J, encompasses 119.9 ac and includes perimeter roads, borrow stockpile and laydown areas and sediment ponds with the landfill footprint of approximately 60 ac. TVA estimates the landfill would provide approximately 15.5 years of disposal capacity based on estimated energy production and consumption rates. Development of Site J would also include construction of a dedicated on-site haul road to convey dry CCR from the plant to the landfill (see Figure 2-3).

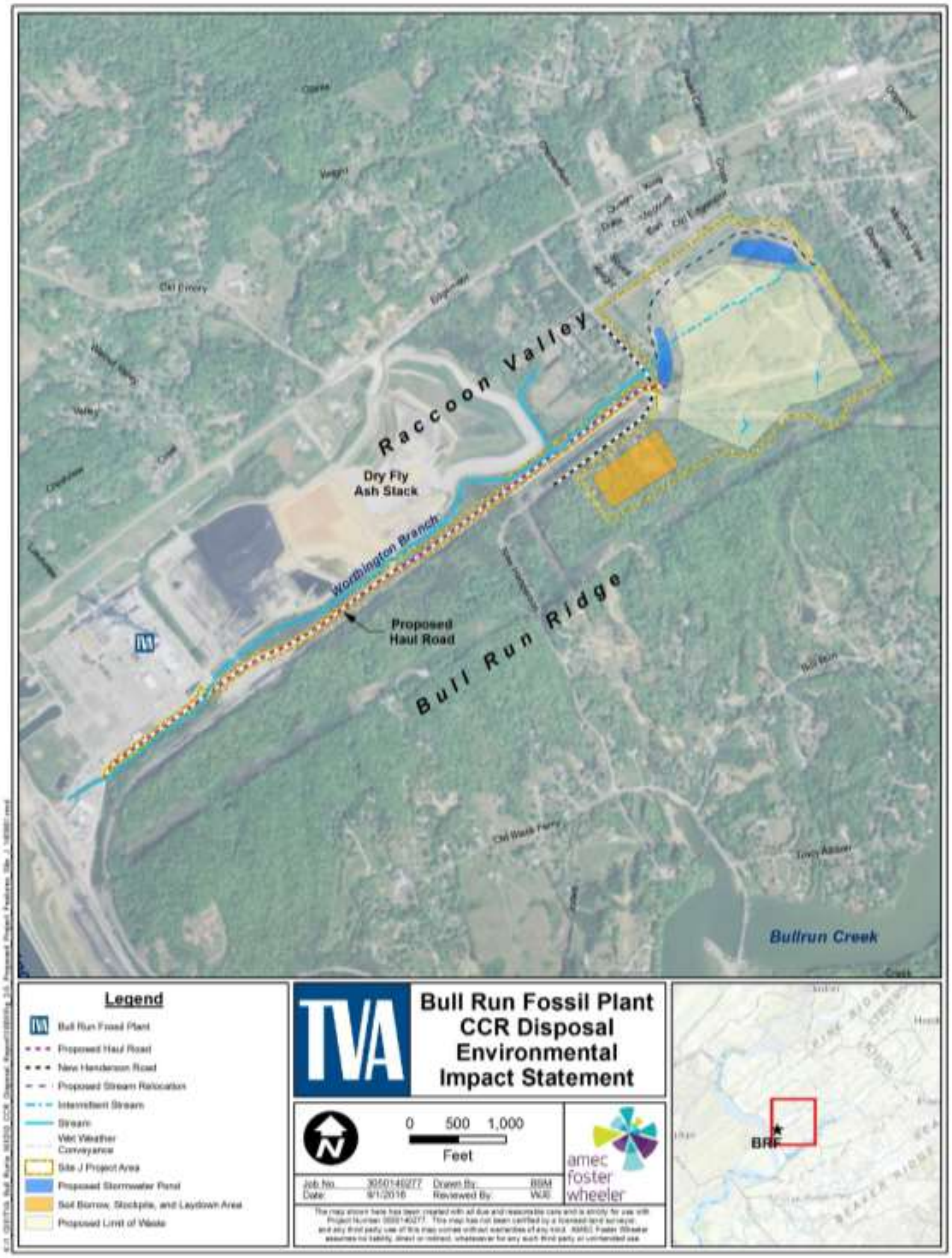


**Figure 2-3. Proposed Project Features at the Alternative B – Site J Location**

#### 2.2.2.1 Landfill Development

The proposed landfill would be developed to meet the requirements of a Class II Solid Waste Facility as specified by TDEC Division of Solid Waste Management and Federal CCR Rule Requirements for new landfills. This would include the following components:

1. Composite Liner System. The composite liner system would meet the TDEC specified standards and would consist of the following components (or equivalent).
    - A 5-ft recompacted geologic buffer material with a maximum permeability of $1x10^{-6}$ centimeters per second (cm/sec).
    - A 2-ft thick compacted clay liner with a maximum permeability of $1x10^{-7}$ cm/sec.
    - A 60 milliliter textured high density polyethylene geomembrane liner.
    - A double-sided geocomposite drainage layer with 6-inch diameter perforated high density polyethylene leachate collection pipes. A 2-ft protective cover.
2. Leachate Collection System. A leachate collection system designed to facilitate the free drainage of leachate would be provided immediately above the liner. The system would consist of a system of perforated leachate collection pipes that would convey the leachate to the collection sump of each cell. Leachate collected would be handled separately from contained surface runoff and would be pumped to the existing treatment system prior to discharge through NPDES Outfall 001.
3. Final Cover System. TVA is proposing a final cover that is 24 inches in thickness for the soil layer, but includes a geomembrane which is consistent with systems used throughout Tennessee. The geomembrane is essentially impermeable, but has a vapor permeability of about $1x10^{-13}$ cm/sec which is better (reduced permeability) than the $1x10^{-7}$ cm/sec specified by TDEC rule 0400-11-01-.04(8)(c)3. In addition, the final cover system essentially eliminates (goes to about zero) infiltration into the underlying waste mass after closure.
4. Soil Borrow/Stockpile and Laydown Area. Excess soil material excavated during construction of the disposal facility would be stockpiled in the designated borrow/stockpile area as shown on Figure 2-3. An estimated 95,100 $yd^3$ of soil would be needed for the interim cover and 190,200 $yd^3$ of soil will be needed for the final cover. Soil balance estimates indicated that sufficient materials will be available from on-site sources. However, where on-site soil is insufficient in terms of quality or quantity, TVA may supplement on-site soil with off-site borrow materials. The location of an off-site permitted borrow area has not been identified at this time, but all borrow will be obtained from an existing permitted borrow site and soil will meet permit requirements.
5. Buffer Zone Standards. The landfill will be located, designed, constructed, operated and maintained such that the fill areas are, at a minimum:
    - 100 ft from all property lines;
    - 500 ft from all residences, unless the owner of the residential property agrees to a shorter distance;
    - 500 ft from all wells determined to be down gradient and used as a source of drinking water by humans or livestock;

- 200 ft from the normal boundaries of springs, streams, lakes, (except that this standard shall not apply to any wet weather conveyance nor to bodies of water constructed and designed to be part of the facility; and
- A total site buffer with no construction appurtenances within 50 ft of the property line.

Buffer distances in relation to the surrounding community are shown on Figure 2-4.

The landfill would be developed in a series of three phases or cells (Appendix C) with construction estimated to last approximately 18 months per cell. Cells are individual subunits of the proposed landfill that can be constructed and operated on an independent basis. Cells 1, 2 and 3 would be constructed sequentially moving from north to south within the landfill footprint as additional disposal capacity is needed. Current design provides for approximately 8.4 million $yd^3$ of disposal capacity.

The maximum height of the CCR facility would be approximately 175 ft above the perimeter road elevation. A conceptual view of the landfill from surrounding roads is identified in Figure 2-5 and Figure 2-6.

Landfill design would include a groundwater monitoring system that meets applicable federal and state requirements.

#### 2.2.2.2 Additional Site Development

A two-lane asphalt haul road (40 ft wide) with paved shoulders would be constructed on-site to transport CCR from the dewatering facility to the landfill. The 1.37 mi haul road would require a bridge to be constructed to convey haul route traffic over New Henderson Road. Based on the current volume of CCR production and the use of articulated dump trucks (capacity of 23 $yd^3$), it is estimated that 65 truckloads per day would be needed to transport CCR to the onsite landfill.

Construction of the landfill at Site J would require relocating the Worthington Branch stream channel, which currently bisects the site. Approximately 2,158 linear ft of channel would be relocated to the north of the existing channel to an approximately 2,700-ft long channel. That channel would require excavation to depths of up to approximately 30 ft, most of which would be in rock. The new stream channel is proposed to be 10-ft wide with approximately 2.5 horizontal to 1 vertical side slopes. The relocation of Worthington Branch would likely require rock excavation with controlled blasting due to the topographic relief and relatively shallow bedrock at the site.

Leachate and storm water that may have contacted CCR materials would be handled separately from non-contact storm water and would be pumped to the to the existing treatment system prior to discharge through NPDES Outfall 001. Storm water that does not have contact with CCR would be discharged from the two storm water detention and settling ponds into the re-located segment of Worthington Branch. This may require modification of the existing Multi-Sector permit to include these two new industrial storm water outfalls. As discharge will adhere to the permit requirements, no impact to water quality is anticipated.

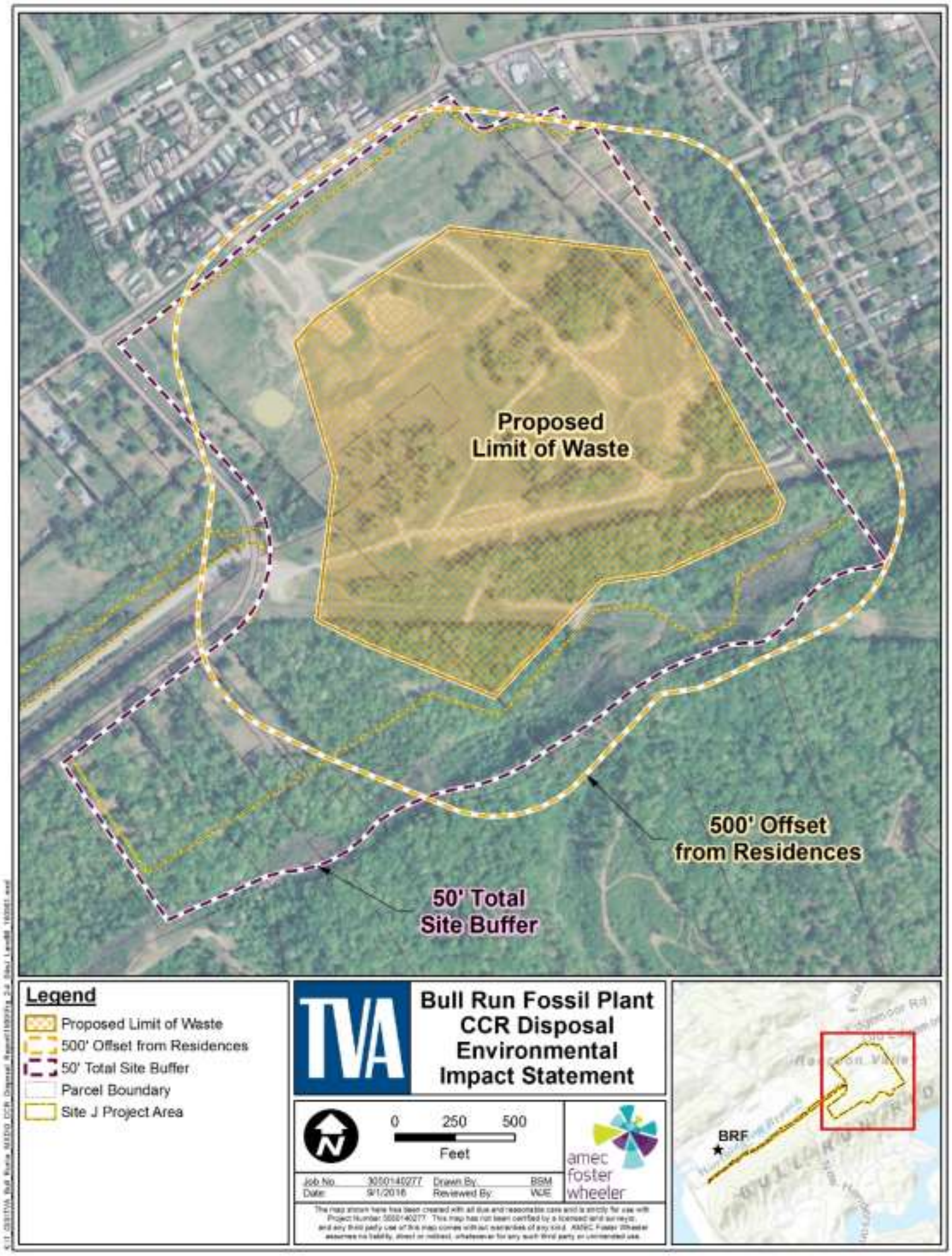


**Figure 2-4. Buffer Distances Alternative B – Site J Location**

**Figure 2-5. Artist Rendering of Proposed Site J Landfill Looking South on Old Edgemoor Road**

**Figure 2-6. Artist Rendering of Proposed Site J Landfill Looking Northeast from the Haul Road**

In the later stages of the landfill operation (development of the third cell), a portion of an existing 69 kilovolt overhead electric transmission line would be relocated. The new alignment would be located within one of the existing transmission corridors located adjacent to the proposed landfill site. These corridors have already been disturbed and the relocation would utilize existing poles/towers or new wooden poles would be added. Any new poles would be located so as to avoid any impacts to natural or cultural resources.

A summary of the primary characteristics of the proposed landfill during both construction and operation is provided in Table 2-3. Design drawings of the proposed landfill are provided in Appendix C.

**Table 2-3. Primary Characteristics of Alternative B - Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)**

| Project Feature | Characteristic | Value |
|---|---|---|
| Construction | Total disturbed area, Site J | 119.9 ac |
| | Total disturbed area, haul road | 14.8 ac |
| | Soil borrow stockpile and laydown area | 8.2 ac |
| | West storm water pond | 1.7 ac |
| | North storm water pond | 2.8 ac |
| | Length of Haul Road | 1.37 mi |
| Height | Elevation of top of waste relative to haul road elevation | 175 ft |
| Stream Relocation | Length of relocation of Worthington Branch for landfill development | 2,158 ft |
| Employment Workforce | Construction | 35 workers |
| | Operation | 5 workers |
| Leachate | Flow to Outfall 001 | <0.05 million gallons per day (MGD) |
| Transport Distance | Length of on-site haul road | 1.37 mi |
| Articulated dump truck traffic volume | Number of fully loaded truckloads needed to haul CCR from BRF to the proposed landfill via a private haul road | 65 truckloads per day. Equates to a traffic count of 130 trips per work day or approximately 15 trucks per hour |

#### 2.2.2.3 Transport Alternatives

TVA considered a range of alternatives to transport CCR materials from BRF to the disposal site. These alternatives included seven options for the haul route to the proposed landfill as well as the use of a conveyer system. While barge and rail transport were considered in the Siting Study, they were not considered feasible options for this EIS given the lack of existing infrastructure and the proximity of Site J to BRF. TVA selected the current alignment as the most favorable alternative for the following reasons:

- It was a relatively straight alignment with few turns, which is the easiest and safest route for truck navigation.
- It was the shortest path to the landfill.
- The road avoids impacts to the railroad, surrounding residential area and church.

This alternative leaves New Henderson Road in-place and includes the construction of a bridge to allow for the proposed haul road to pass over the existing road, therefore eliminating an intersection of the proposed haul road and New Henderson Road.

### 2.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill. For the purposes of this EIS, the off-site landfill would be permitted to receive CCR and would have the capacity to do so. The analysis of impacts associated with this alternative are based on the closest landfill that can currently accept CCR material, the Chestnut Ridge Landfill. The Chestnut Ridge Landfill is a Class 1 Municipal Solid Waste Facility located approximately 12 mi northeast of BRF. Under this Alternative, dry CCR generated at BRF would be transported by over-the-road tandem dump trucks on existing roadways to the Chestnut Ridge Landfill for disposal. While barge and rail transport were considered in the previous Siting Study, they were not considered feasible options for this EIS given the lack of existing infrastructure and the proximity of Chestnut Ridge to BRF. Based on the current volume of CCR production and the use of over-the-road tandem dump trucks (capacity of 15 $yd^3$), it is estimated that 100 truckloads per day throughout the life of the landfill (estimated at 15.5 years) would be needed to transport CCR to the offsite landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize the following public roads: Edgemoor Road and Raccoon Valley Road (both of which represent SR 170) and Fleenor Mill Road (Figure 2-7). The landfill is owned and operated by Waste Management of Tennessee and serves the Knoxville metro area and central Tennessee. Capacity at this landfill can be expanded to accommodate TVA's requirement for long-term storage of CCR generated at BRF.

The Chestnut Ridge Landfill site is an existing landfill, and new previously unpermitted impacts to the natural environment as a result of disposing of CCR at this landfill are not anticipated. Therefore, the analysis provided in this EIS is limited to the evaluation of characteristics related to transportation of CCR from BRF to the Chestnut Ridge Landfill. These characteristics are summarized in Table 2-4.

**Table 2-4. Primary Characteristics of Alternative C – Transport of CCR to Chestnut Ridge**

| Project Feature | Characteristic | Value |
|---|---|---|
| Size | Size of current landfill | 166 ac |
| Location | Distance from BRF | 12 mi |
| Tandem Dump Truck Traffic Volume | Number of truckloads needed to haul CCR from BRF to an off-site landfill (Chestnut Ridge) | 100 truckloads per day. Equates to a traffic count of 200 trips per work day or approximately 23 trucks per hour |

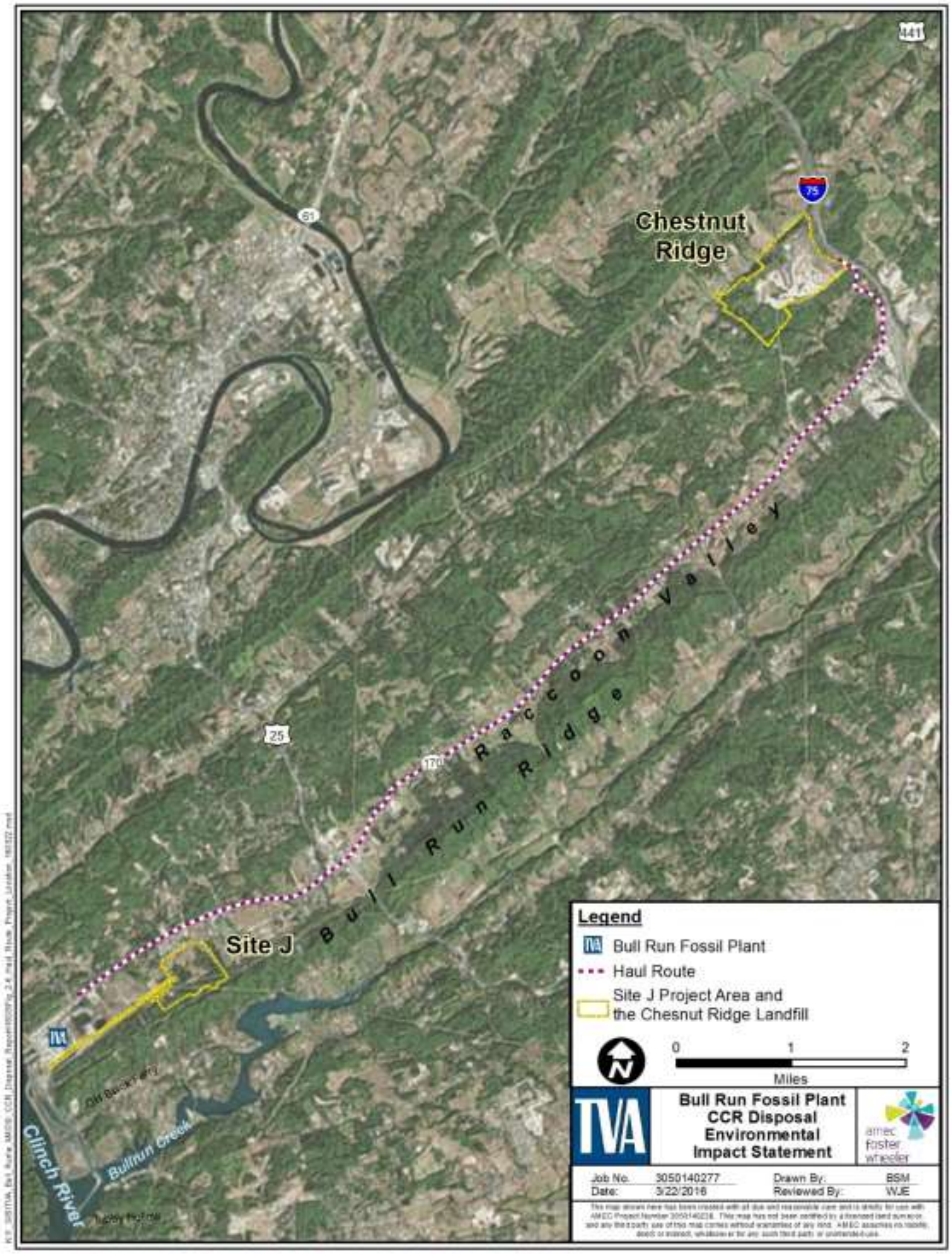


**Figure 2-7. Haul Route to the Chestnut Ridge Landfill as Proposed Under Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill**

## 2.3 Summary of Alternative Impacts

The environmental impacts of Alternatives A, B and C are summarized in Table 2-5. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

**Table 2-5. Comparison of Impacts of Each Alternative by Resource Area**

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| **Air Quality** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in emissions. | Temporary minor impacts during construction from fugitive dust and emissions from equipment and vehicles. | Localized impact due to emissions from increased vehicles used to transport and manage CCR. |
| **Climate Change** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in GHG emissions. | Minor GHG emissions associated with onsite construction equipment. No discernable effect on regional GHG levels. | No impact associated with construction, however due to increased vehicle miles travelled and use of public roadways, GHG emissions would be higher than Alternative B. |
| **Land Use** | | |
| No impact. | Impact resulting from the conversion of undeveloped land to an industrial facility. Impact to communities adjacent to the landfill would be moderate, but overall impact minor due to previous disturbance and location adjacent to industrial plant. | No impact. |
| **Prime Farmland** | | |
| No impact. | No impact | No impact. |
| **Geology and Seismology** | | |
| No impact. | No impact. Potential seismic risk mitigated with proper design. | No impact. |
| **Groundwater** | | |
| No impact. | Minor impact due to incorporation of low permeability synthetic liner and leachate collection and treatment system. Runoff would be controlled with appropriate BMPs. | No impact. |
| **Surface Water** | | |
| No impact. | Minor temporary impacts due to runoff during construction. Direct permanent impacts to the upper reach of Worthington Branch. Mitigated as a result of adherence to permit requirements and payment to an appropriate stream bank and / or restoration onsite. | No impact. |
| **Floodplains** | | |
| No impact. | No impact. | No impact. |
| **Vegetation** | | |
| No impact. | Minor impact resulting from the disturbance of a predominantly previously disturbed area that lacks notable plant communities. | No impact. |
| **Wildlife** | | |
| No impact. | Minor impact due to loss of predominantly previously disturbed habitat. | No impact |

## Table 2-5. Comparison of Impacts of Each Alternative by Resource Area

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| **Aquatic Ecology** | | |
| No impact. | Permanent impact to Worthington Branch and aquatic resources due to stream realignment and culverts. However, impacts would be mitigated via payment to an appropriate stream bank and reconstruction of stream channel and associated habitat onsite. | No impact. |
| **Threatened and Endangered Species** | | |
| No impact. | Minor impact as a result of the loss of bat foraging and roosting habitat. Impact would be mitigated in accordance with ESA requirements. | No impact. |
| **Wetlands** | | |
| No impact. | Direct impact to 2.1 ac of wetland. However these impacts would be mitigated as required by both state and federal agencies. | No impact. |
| **Solid and Hazardous Waste** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in solid waste produced at BRF. | Minor increase in solid waste generated during construction. Long-term impact associated with the management of solid wastes produced at BRF at Site J as CCR would be disposed n a new landfill. | Long-term impact to the capacity of an existing landfill which limits long-term ability to meet other disposal needs in the region. |
| **Socioeconomic Resources** | | |
| No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in significant adverse effects on local employment and economic measures. | Minor short term increases in employment and, payroll during construction resulting in beneficial direct and indirect economic impacts. Negligible long-term beneficial economic impacts.<br><br>Minor impact to the access to Valley View Church and Church of Christ during construction due to construction related traffic. | Negligible impact due to anticipated minimal employment increase. |
| **Environmental Justice** | | |
| No impact. | Minor to moderate indirect impact to potential EJ community due to increased noise, dust and traffic during construction.<br>Landfill would present a visual impact during operation, partially mitigated by a vegetated buffer. No impact associated with haul of CCR to the landfill. | Moderate impact to potential EJ community due to additional traffic noise and dust associated with transport of CCR. However, this impact would not be disproportionate. |
| **Natural Areas, Parks and Recreation** | | |
| No impact. | Minor indirect impact during construction due to increased vehicles on surrounding roadways.<br>No impact during operation. | Moderate indirect impact to facilities along the haul road. |
| **Transportation** | | |
| No impact. | Minimal short term impact to traffic on New Henderson Road during construction of haul road. No impact during operation. | Moderate impact related to increased traffic and potential increase in crash rates during operation. |
| **Visual Analysis** | | |

**Table 2-5. Comparison of Impacts of Each Alternative by Resource Area**

| Alternative A – No Action | Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J) | Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge) |
|---|---|---|
| No impact. | The landfill would change the existing visual integrity which would result in a moderate impact to the viewshed of some members of the surrounding community. However, due to the modifications of the landscape from previous development, as well as the adjacent fossil plant, there would be minimal change in overall scenic value | No impact. |
| **Cultural and Historic Resources** | | |
| No impact. | No impact. | No impact. |
| **Noise** | | |
| No impact. | Minor impact. | Moderate impact. |
| **Public Health and Safety** | | |
| No impact | Worker and public health and safety during construction and operation would be maintained and impacts any impact would be minor. | Increased traffic would increase the potential risk of injuries and fatalities associated with truck crashes. |
| **Cumulative Effects** | | |
| No impact. | Minimal impact to overall scenic value due to maintenance of vegetative buffer. | Minor to moderate impact to transportation due to cumulative effect of increased traffic on SR 170 associated with ash impoundment closure. |

## 2.4 Identification of Mitigation Measures

Mitigation measures identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. TVA's analysis of the preferred alternative includes mitigation, as required, to reduce or avoid adverse effects. Project-specific best management practices (BMPs) are also identified.

Mitigation measures include:

- Due to the loss of potentially suitable foraging and roosting habitat for endangered bat species, Section 7 consultation with U.S. Fish and Wildlife (USFWS) will be required. Given the occurrence of potentially suitable roosting habitat for some endangered bat species, all tree clearing would be limited to those times of the year when bats are not expected to be roosting in the area (October 1 through March 31). Impact to bat habitat would be mitigated in accordance with ESA requirements.

- TVA has coordinated with TDEC and USACE and has proposed mitigation for areas impacted by relocation and/or encroachment of Worthington Branch through payment to an appropriate stream bank and/or restoration on-site.

- Actions involving wetlands and/or stream crossings and stream alterations would be subject to requirements outlined in the federal Clean Water Act Section 404 permit and the TDEC Aquatic Resources Alteration Permit (ARAP). TVA would adhere to all conditions stipulated in these permits.

- TVA will maintain the plantings along the portion of Site J adjacent to Old Edgemoor Road to continue to provide a vegetative screen.

- TVA will develop a fugitive dust plan which identifies adequate dust control measures for this site. As per CCR rule requirements TVA has developed a fugitive dust hotline where concerns regarding fugitive dust can be recorded. Every year TVA will prepare a report detailing the dust controls used, any citizen complaints received, and a summary of any corrective actions taken.

- TVA will implement a groundwater monitoring plan that adheres to the requirements established in the CCR Rule and those established by TDEC.

BMPs employed to minimize impacts include:

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and other appropriate BMPs (CAA Title V operating permit incorporates fugitive dust management conditions).
- Erosion and sedimentation control BMPs (e.g., silt fences) would reduce the potential for erosion of soil minimizing the potential for impact to surface waters during construction.
- Consistent with EO 13112, disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- TVA would implement operational mitigations to reduce potential surface water impacts from CCR operations, such as requiring that no more than 10 ac of ash be exposed at any one time.
- A Storm water Pollution Prevention Plan will be created to limit the size of the disturbed areas and to divert storm water runoff away from construction areas into existing ponds.
- Construction debris and excess materials will be disposed of properly.
- TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted.
- Proper spill prevention measures will be taken to reduce the potential for spills of fuel//lube/insulation oil.
- Subcontractor and prime contractor employees would require Occupational Safety and Health Administration (OSHA) 1910.120 training.

## 2.5 Preferred Alternative

TVA has identified Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J) as the preferred alternative. Implementation of Alternative B would result in minimal impacts to the environment whereas Alternative C, which utilizes an existing, permitted landfill, would result in few impacts to the natural environment. However, Alternative B would achieve the purpose and need of the project with minimal environmental impact and avoids the off-site transport of CCR along public roads, and eliminates the long-term impacts associated with e air emissions, increased traffic and associated long-term safety risks, and disruptions to the public that would be associated with such off-site transport.

# CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

## 3.1 Air Quality

### 3.1.1 Affected Environment

Through passage of the CAA, Congress mandated the protection and enhancement of our nation's air quality resources. National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants have been set to protect the public health and welfare:

- Sulfur dioxide ($SO_2$)
- Ozone
- Nitrogen dioxide ($NO_2$)
- Particulate matter whose particles are less than or equal to 10 micrometers ($PM_{10}$)
- Particulate matter whose particles are less than or equal to 2.5 micrometers ($PM_{2.5}$)
- Carbon monoxide (CO)
- Lead

The primary NAAQS were promulgated to protect public health, and the secondary NAAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air (USEPA 2016). Areas in violation of the NAAQS are designated as nonattainment areas. New sources to be located in or near these areas may be subject to more stringent air permitting requirements.

Anderson County is in attainment for all criteria pollutants. EPA has designated nearby Knox and Loudon counties as nonattainment for $PM_{2.5}$ and Roane County is partial nonattainment for $PM_{2.5}$. However in July 20, 2012, Anderson County was re-designated partial nonattainment for ozone. The BRF project site is included in the area designated as nonattainment for ozone.

### 3.1.2 Environmental Consequences

#### 3.1.2.1 Alternative A – No Action

Under this alternative TVA would not seek additional disposal options for placement of CCRs generated at BRF. Rather, CCRs would continue to be stored in the current on-site dry fly ash stack, and fugitive emissions associated with this stack will continue to occur in the short term no matter what alternative CCR disposal method is implemented at BRF. BMPs are employed to reduce emissions from this landfill to ensure adherence to permit requirements; therefore, there is no impact to air quality associated with current landfill operations. In the long term, however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, emissions would be reduced within the immediate region. However, because any impact to operations at BRF would not be consistent with TVA's long-range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

### 3.1.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

#### 3.1.2.2.1 Construction Impacts

Construction of the proposed landfill and its associated haul road would require the use of earthmoving, compacting and paving equipment as well as trucks for hauling materials. Additionally, some controlled blasting would be required to create the new bypass channel for Worthington Branch. All construction activities would be carried out on-site, and no off-site activities are anticipated. These activities would generate fugitive dust during active construction periods. The largest fraction (greater than 95 percent by weight) of fugitive dust would be deposited within the construction site boundaries. Wet suppression and other BMPs would be utilized, which can reduce fugitive dust emissions by as much as 95 percent. TVA will obtain the proper Construction Permit from TDEC and would comply with its protective provisions.

Construction activities that generate fugitive dust and emissions have the potential to affect local ground-level ozone and particulate matter levels. Because EPA has identified areas near BRF as nonattainment for ozone (for both the 2008 standard and presumably the new standard of 0.070 parts per million), TVA will use BMPs to minimize fugitive dust and emissions and will work with TDEC to obtain the proper permits to ensure protection of the environment, the workforce and nearby residents.

Equipment expected to be required for this alternative includes excavators (two), bulldozers (three), a water truck, a loader, pickup trucks (five), ATV buggies (three) and semi-trailers. All equipment would be used on-site and any air quality impacts would be limited to the immediate site area. Emissions associated with the combustion of gas and diesel fuels by internal combustion engines would generate local emissions of PM, $NO_2$, CO, volatile organic compounds (VOC) and $SO_2$ during the construction period. Therefore, given the relatively low number and types of equipment that would be used for the initial construction activities, and the intermittent nature of construction, emissions from construction equipment would be minor and temporary in nature.

#### 3.1.2.2.2 Operation Impacts

Operation of the proposed landfill would comply with Tennessee regulations for fugitive emissions and BRF's air operating permit conditions. CCR handling, transport and placement activities would utilize methods similar to on-going landfill operations at BRF. In order to minimize fugitive dust from landfill operations, CCR would be moisture-conditioned and transported to the working face of the landfill using heavy-duty dump trucks over paved access roads contained within the boundaries of the plant. Once placed, the CCR material would be spread and compacted. Other measures to control dust inside the limits of the proposed landfill may include mulch, wind breaks/barriers, tillage and stones as permitted by an approved air permit. At the end of each day's activities, the surface of the landfill would be sealed as practicable with a smooth drum roller. As areas of the landfill reach their capacity, they would be covered with an approved cover system.

Equipment used for landfill operations would be similar to what is currently in use at the existing dry fly ash stack and therefore there would be no substantive change in emissions as compared to base conditions.

#### 3.1.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Since the Chestnut Ridge Landfill is an existing permitted landfill, there would be no changes from the existing environment associated with initial construction activities. However, it is likely that additional heavy equipment would be used on-site to manage incoming CCR. This equipment would include dump trucks and bulldozers to spread CCR material, and compacters for consolidation. Use of this equipment would result in a localized increase in emissions which would negatively impact local air quality. However, it is anticipated that all construction vehicles would be maintained in good working condition and be installed with current emission control technologies.

It is estimated that 100 truckloads (traffic count of 200 trips per day) would be required on a fulltime basis (typical 5-day work week) to haul the CCR from BRF to the Chestnut Ridge Landfill. This increase in vehicles on the roadway would generate local emissions of PM, $NO_2$, CO, VOC and $SO_2$ throughout the operational period (up to 15.5 years). This increase in vehicles (estimated to equate to 23 truck trips per hour, based on a 9-hour day) represents a moderate increase in traffic especially along SR 170 which currently experiences congestion during peak hours of the day. Although the impact on air quality in this congested area as a result of the increase in traffic is expected to be moderate, the regional impact on air quality would be minor given the relatively low traffic volumes in the vicinity of BRF. Therefore, exceedances of applicable ambient air quality standards are not expected. It is anticipated that all trucks used to transport CCR would be maintained in good working condition with current emission control technologies that would minimize local air quality impacts.

Emissions associated with Alternative C would not result in an exceedance of applicable air quality standards. However, emissions from the additional construction vehicles needed to manage the transportation of CCR from BRF to the Chestnut Ridge Landfill and also manage the placement of CCR at the landfill are expected to result in long-term local effects that would be greater than those evident under Alternative B.

## 3.2 Climate Change and Greenhouse Gases

### 3.2.1 Affected Environment

The average temperature in the United States has increased by 1.3 to 1.9°F since record keeping began in 1895; most of this increase has occurred since about 1970. The most recent decade was the nation’s warmest on record and temperatures in the United States are expected to continue to rise. Because human-induced warming is superimposed on a naturally varying climate, the temperature rise has not been, and will not be, uniform or smooth across the country over time (Melillo et al. 2014).

The 2014 National Climate Assessment concluded that global climate is projected to continue to change over this century and beyond. The amount of warming projected beyond the next few decades is directly linked to the cumulative global emissions of greenhouse gas and particles by these studies. By the end of this century, the 2014 National Climate Assessment concluded that a 3°F to 5°F rise can be projected under the lower emissions scenario and a 5°F to 10°F rise for a higher emissions scenario (Melillo et al. 2014). As with all future scenario modeling exercises, there is an important distinction to be made between a “prediction” of what “will” happen and a “projection” of what future conditions are likely given a particular set of assumptions. (Melillo et al. 2014).

#### 3.2.1.1 Southeastern United States

The Southeastern United States is one of the few regions globally that does not exhibit an overall warming trend in surface temperature over the 20th century. This “warming hole” also includes part of the Great Plains and Midwest regions in the summer. Historically, temperatures increased rapidly in the Southeast during the early part of the 20th century, then decreased rapidly during the middle of the 20th century. Since the 1960s, temperatures in the Southeast have been increasing. Recent increases in temperature in the Southeast have been most pronounced in the summer season, particularly along the Gulf and Atlantic coasts. However, temperature trends in the Southeast over the period from 1895 to 2011 are found to be statistically insignificant for any season. Generally, in the Southeast, the number of extreme hot days has tended to decrease or remain the same while the number of very warm summer nights has tended to increase. The number of extreme cold days has tended to decrease. Global warming is a long-term trend, but that does not mean that every year will be warmer. Day-to-day and year-to-year changes in weather patterns will continue to produce variation, even as the climate warms. Generally, climate change results in Earth’s lower atmosphere becoming warmer and moister, resulting in the potential for more energy for storms and certain severe weather events. Trends in extreme rainfall vary from region to region (Kunkel et al. 2013).

#### 3.2.1.2 Greenhouse Gases

In nature, $CO_2$ is exchanged continually between the atmosphere, plants and animals through processes of photosynthesis, respiration and decomposition; and between the atmosphere and ocean through gas exchange. Billions of tons of carbon in the form of $CO_2$ are absorbed by oceans and living biomass (i.e., sinks) and are emitted to the atmosphere annually through natural and man-made processes (i.e., sources). When in equilibrium, carbon fluxes among these various global reservoirs are roughly balanced (Galloway et al. 2014). $CO_2$, however, constitutes less than 1/10th of a percent of the total atmosphere gases.

Similar to the glass in a greenhouse, certain gases, primarily $CO_2$, $NO_x$, methane, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, absorb heat that is radiated from the surface of the Earth. Increases in the atmospheric concentrations of these gases can cause the Earth to warm by trapping more heat. The common term for this phenomenon is the “greenhouse effect,” and these gases are typically referred to as “greenhouse gases” (GHG). Atmospheric levels of $CO_2$ are currently increasing at a rate of 0.5 percent per year. Atmospheric levels measured at Mauna Loa, Hawaii and at other sites around the world reached 400 parts per million in 2013, higher than the Earth has experienced in over a million years (Walsh et al. 2014). The extent to which GHGs contribute to or are responsible for increased temperatures is the subject of scientific debate.

While water vapor is the most abundant GHG in the atmosphere, it is not included in the above list of GHGs because changes in the atmospheric concentration of water vapor are generally considered to be the result of climate feedbacks related to the warming of the atmosphere rather than a direct result of human activity. However, the impact of water vapor is critically important to projecting future climate change and this is not yet well understood. Quantifying the effects of feedback loops on global and regional climate is the subject of on-going data collection and active research (Walsh et al. 2014).

#### 3.2.1.3 Greenhouse Gases and Electric Utilities

The primary GHG emitted by electric utilities is $CO_2$ produced by the combustion of coal and other fossil fuels. Hydrofluorocarbon-containing refrigeration equipment is widely used in industry, and these gases are emitted to the atmosphere in small amounts primarily through equipment leaks. Sulfur hexafluoride which is used as a gaseous dielectric medium for high-voltage (one kilovolt and above) circuit breakers, switchgears and other electrical equipment is also emitted in small amounts to the atmosphere. Methane is emitted during coal mining and from natural gas wells and delivery systems.

In 2014, worldwide man-made annual $CO_2$ emissions were estimated at 36 billion tonnes, with sources within the U.S. responsible for about 15 percent of this total (Le Quéré et al. 2015). Electric utilities in the United States, in turn, emit 2.039 billion tons, roughly 32 percent of the U.S. total (USEPA 2014). In 2013, fossil-fired generation accounted for 51 percent of TVA's total electric generation, and the non-emitting sources of nuclear, hydro and other renewables accounted for 49 percent. Compared to $CO_2$ emissions from the entire TVA system in 2005 to those in 2014, TVA has reduced its $CO_2$ emission by over 30 percent and anticipates achieving a total $CO_2$ emission reduction of 40 percent by 2020.

#### 3.2.1.4 Greenhouse Gases and Mobile Sources

According to the U.S. Greenhouse Gas Inventory Report: 1990-2013 (USEPA 2014), the transportation sector accounted for roughly 27 percent of total U.S. greenhouse gas emissions. Medium and heavy-duty trucks were about 23 percent of all transportation sector emissions.

### 3.2.2 Environmental Consequences

#### 3.2.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct or operate a new CCR landfill. There would be no change to current conditions. Once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, plant emissions would be reduced within the immediate region. However, because any impact to operations at BRF would not be consistent with TVA's long-range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

#### 3.2.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this alterative, TVA would construct a landfill for disposal for dry CCR on TVA-owned property located adjacent to BRF. Development of this landfill would also include construction of an on-site haul road to convey dry CCR from the plant to the landfill. TVA would construct this road on the BRF site next to the existing railroad track. CCR would be hauled from the dewatering facility and ash silos to the landfill (a round-trip distance of 2.74 mi). A total of 65 truckloads of CCR would be transported to the landfill each day. Considering that transport of CCR would equate to a traffic count of 130 trips per day (typical 5-day work week) along the haul route, GHG emissions associated with vehicle miles traveled would be insignificant.

$CO_2$ emissions would occur during the construction phase. Construction-related $CO_2$ emissions would be primarily related to the combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.). The total amount of these emissions would be small and would result in no significant impact to climate change.

#### 3.2.2.3 Alternative C – Off-Site Transport of CCR to an Existing, Permitted Landfill (Chestnut Ridge)

Under Alternative C, TVA would transport dry CCR by truck from BRF to the Chestnut Ridge Landfill using existing roadways. Chestnut Ridge is located approximately 12 mi northeast of BRF and it is estimated that transport of CCR would require 100 truckloads of CCR per day which would equate to a traffic count of 200 trips along the route to the landfill during a typical 5 day work week. As with Alternative B, greenhouse gas emissions associated with vehicle miles traveled would be insignificant. However, given the increased vehicle miles traveled and the use of public roadways which may require increased idling time, GHG emissions would be notably higher than Alternative B.

## 3.3 Land Use

### 3.3.1 Affected Environment

The BRF facility is located in Anderson County, Tennessee, near the convergence of the Clinch River and Bullrun Creek, approximately 8 mi southwest of the city of Clinton. The plant property occupies approximately 750 ac of land bordered by residential and rural properties to the north, northeast and northwest. Figure 3-1 identifies land uses in the region surrounding BRF. As summarized in Table 3-1, land use within the region surrounding the BRF site is dominated by deciduous forest land, pasture/hay land and developed lands.

**Table 3-1. Land Use/Land Cover within the Project Area and the Region**

| Land Use Type | Acres Within Site J and Haul Route[1] | Acres within 5-mi Radius |
|---|---|---|
| Emergent Herbaceous Wetlands | 2.1 | 22.7 |
| Cultivated Crops | | 63.0 |
| Barren Land (Rock/Sand/Clay) | | 177.0 |
| Shrub/Scrub | 0.6 | 268.8 |
| Developed High Intensity | | 630.6 |
| Woody Wetlands | | 752.7 |
| Grassland/Herbaceous | 46.6 | 1,754.4 |
| Mixed Forest | | 1,791.4 |
| Evergreen Forest | | 1915.7 |
| Developed, Medium Intensity | | 2,285.8 |
| Open Water | | 2,417.2 |
| Developed, Low Intensity | 14.9 | 6,035.9 |
| Developed, Open Space | 14.5 | 7,584.8 |
| Pasture/Hay | | 8,106.9 |
| Deciduous Forest | 56.0 | 16,458.0 |
| **Total** | **134.7** | **50,264.9** |

[1] Land cover type within Site J has been modified based on more recent field surveys and aerial images.
Source: Homer et al. 2015

The Clinch River forms the southwest boundary and Bullrun Creek, a branch of the Clinch River, is to the south.

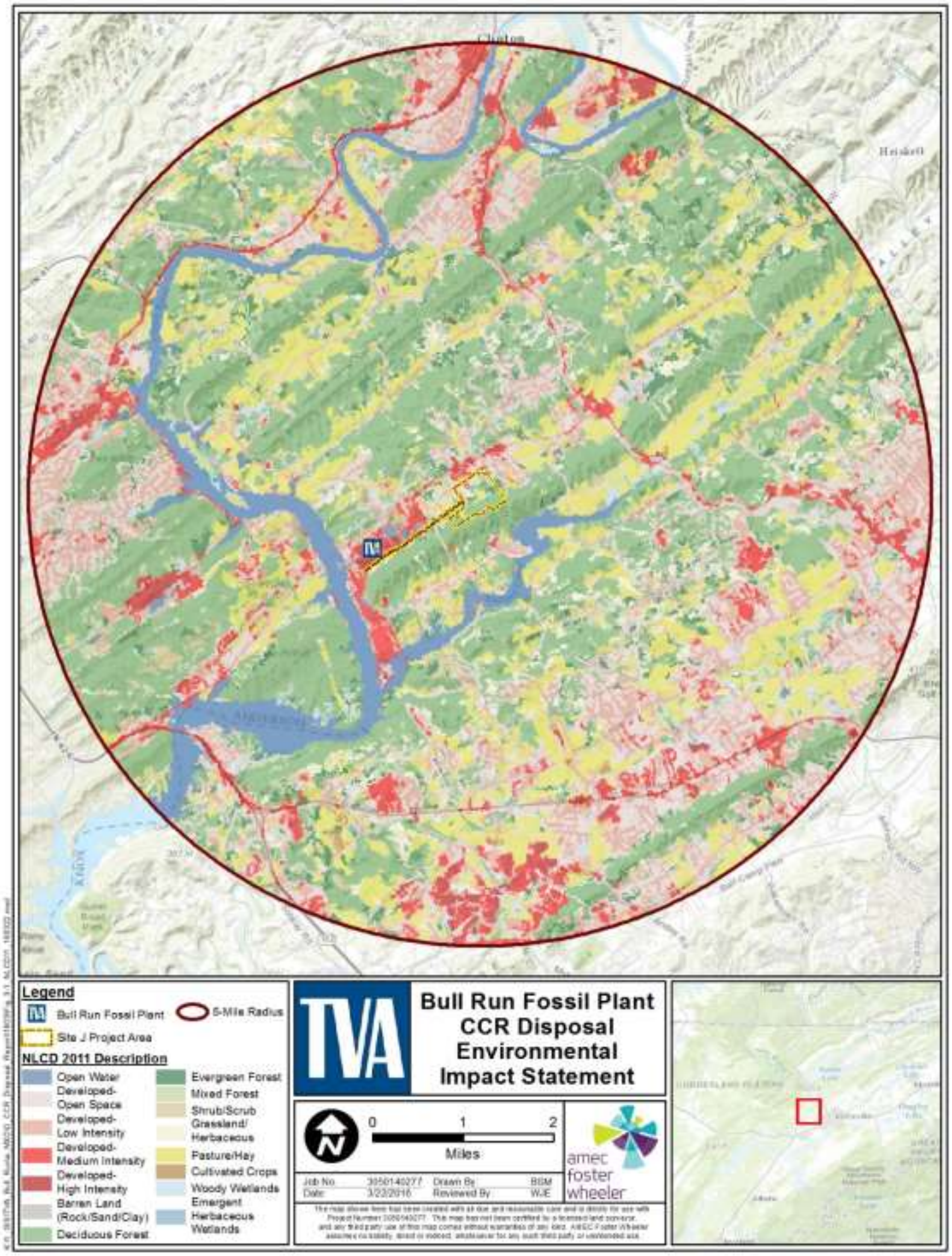


**Figure 3-1. Land Use/Land Cover in the Vicinity of Site J**

Site J covers approximately 119.9 ac and straddles Worthington Branch, a creek that bisects the property from northeast to southwest and eventually discharges into the Clinch River. The proposed haul route covers approximately 14.8 ac and extends from BRF to Site J. Portions of the area within Site J were previously used as pasture land and include two former 0.5-ac former ponds (breached and drained) located north of Worthington Branch. It is bordered by Old Edgemoor Lane to the north, New Henderson Road to the west, Isabella Lane to the east and Bullrun Ridge to the south. During construction of the houses that were previously on this site, the land was cleared and leveled, and the lots were landscaped with trees and turf grass. Since TVA's acquisition of the site in 2012, the houses and associated structures have been demolished and removed (TVA 2013). Land cover on the site generally consists of old field community with scattered trees in areas that were formerly developed and more established forested areas that were not disturbed by prior development (see Section 3.9, Vegetation).

The nearest residential structure is located directly adjacent to the eastern limits of Site J. The Clinch River is used for recreational and commercial purposes. Surrounding areas are primarily residential with some areas zoned commercial to the northwest and heavy industrial to the west where the plant is located.

Landfills in the state of Tennessee are regulated by the TDEC Division of Solid Waste Management. A coal ash landfill would be required to obtain a Solid Waste Class II Disposal Permit from TDEC. Under Alternative B, TVA would take action to obtain the necessary permits. Construction of the landfill would adhere to the provisions outlined in the TDEC Rule Chapter 0400-11-01-.02, Solid Waste Storage Processing and Disposal Facilities. These requirements include the adherence to the necessary buffer zone standards as identified below:

- 100 ft from all property lines,
- 500 ft from all residences, unless the owner of the residential property agrees to a shorter distance,
- 500 ft from all wells determined to be down gradient and used as a source of drinking water by humans or livestock,
- 200 ft from the normal boundaries of springs, streams, lakes, (except that this standard shall not apply to any wet weather conveyance nor to bodies of water constructed and designed to be part of the facility, and
- A total site buffer with no construction appurtenances within 50 ft of the property line.

As a federal agency, TVA is not subject to state and local zoning laws; nevertheless, TVA considers applicable zoning regulations for the purpose of analyzing impacts. Zoning ordinances for Anderson County do not identify conditions specific to CCR or solid waste landfills, but do provide conditions that must be met to allow a sanitary landfill. In Anderson County, landfills are permitted in the Environmental Industrial (I-3) District, which allows for heavy industrial uses. Site J is not located in the I-3 District, but landfills would be permitted as a special exception following a review by the board of Zoning Appeals.

### 3.3.2 Environmental Consequences

#### 3.3.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, there would be no changes to existing land uses.

#### 3.3.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

The potential construction-related land use impacts to the site and off-site areas are based on the site utilization plan illustrated in Figure 2-3. The parcels proposed for operations and construction-related activities are currently zoned for suburban-residential (R-1); however, all of the residences and associated buildings have been removed since TVA acquired the property. The site is currently in an undeveloped state and covered with various vegetation cover types.

Construction of the proposed facility would result in the permanent conversion of 134.7 ac (Site J and haul road) of land that is currently undeveloped to industrial facilities. Permanent industrial facilities include the construction of the landfill, access road, borrow stockpile, laydown areas and any supporting structures.

BMPs and erosion and sediment controls will be implemented to control runoff and reduce transport and deposition of sediments within receiving streams.

The conversion of undeveloped lands to industrial facilities is minor when compared to the abundance of undeveloped land within a 5-mi radius of the site (see Table 3-1 and Figure 3-1). Therefore, impacts to land use from the construction and operation of a proposed landfill would be minor. However, because the site is currently undeveloped, TVA agrees that the change in land use would have a locally moderate impact on the communities adjacent to the facility.

#### 3.3.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because the Chestnut Ridge Landfill is an existing permitted landfill, there would be no impacts to land uses that have not already been considered in the issuance of the existing landfill permit.

## 3.4 Prime Farmland

### 3.4.1 Affected Environment

The 1981 Farmland Protection Policy Act (7 Code of Federal Regulations [CFR] Part 658) requires all federal agencies to evaluate impacts to prime and unique farmland prior to permanently converting to land use incompatible with agriculture. Prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. These characteristics allow prime farmland soils to produce the highest yields with minimal expenditure of energy and economic resources. In general, prime farmlands have an adequate and dependable water supply, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content and few or no rocks. Prime farmland soils are permeable to water and air, not excessively erodible or saturated for extended period and are protected from frequent flooding.

Within the Site J project area, most (85 percent) of the soils are not considered to be prime farmland soils (Table 3-2). Dominant soils within the project area include Collegedale silt loam, Salacoa silt loam and Collegedale-Rock outcrop complex. Approximately 15 percent of the lands within the project area are represented by soils classified as prime farmland. All of the prime farmland soils are located along Worthington Branch in the northeast section of the site (Figure 3-2). Prime farmland soil types within Site J include Tasso loam, Hamblen silt loam and Swafford loam. There is also some Cedarbluff loam, which is considered to be prime farmland soil if drained.

**Table 3-2. Soil Types Mapped Within the Proposed Project Area**

| Soil Mapping Unit | Prime Farmland | Acres | Percent of Area |
|---|---|---|---|
| **Prime Farmland** | | **19.9** | **14.8%** |
| Tasso Loam | Yes | 3.3 | 2.4% |
| Hamblen Silt Loam | Yes | 4.1 | 3.0% |
| Swafford Loam | Yes | 4.5 | 3.3% |
| Cedarbluff Loam | Yes, if drained | 8.0 | 5.9% |
| **Not Prime Farmland** | | **114.8** | **85.2%** |
| Dewey Silt Loam | No | 2.6 | 1.9% |
| Collegedale Clay | No | 7.3 | 5.4% |
| Udorthents | No | 10.9 | 8.1% |
| Collegedale Silt | No | 19.1 | 14.2% |
| Salacoa Silt Loam | No | 30.2 | 22.4% |
| Collegedale-Rock Outcrop Complex | No | 44.7 | 33.2% |
| **Total** | | **134.7** | **100.0%** |

### 3.4.2 Environmental Consequences

#### 3.4.2.1 Alternative A – No Action

Under Alternative A, there would be no new ground-disturbing activities. As a result, no impacts to prime farmland would occur.

#### 3.4.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Alternative B would result in minor impacts to soils with prime farmland characteristics, but the proposed site is zoned residential and no farming operations are occurring onsite. Based on the proposed development plan, impacts from construction and operation of the facility include approximately 20 ac of prime farmland within the limits of disturbance. Within this area, there would be some areas that would not include substantial ground disturbance activities.

Approximately 7,241.6 ac (14.4 percent) of the area within 5 mi have soils classified as prime farmland. The largest concentrations of prime farmland soils are located south of the BRF facility (see Figure 3-2). The minor loss of on-site prime farmland soils is not significant when compared to the amount of land designated as prime farmland within the surrounding region. In addition, Site J had previously been used and zoned for residential use, which resulted in the disturbance of much of the land during housing development on the site.

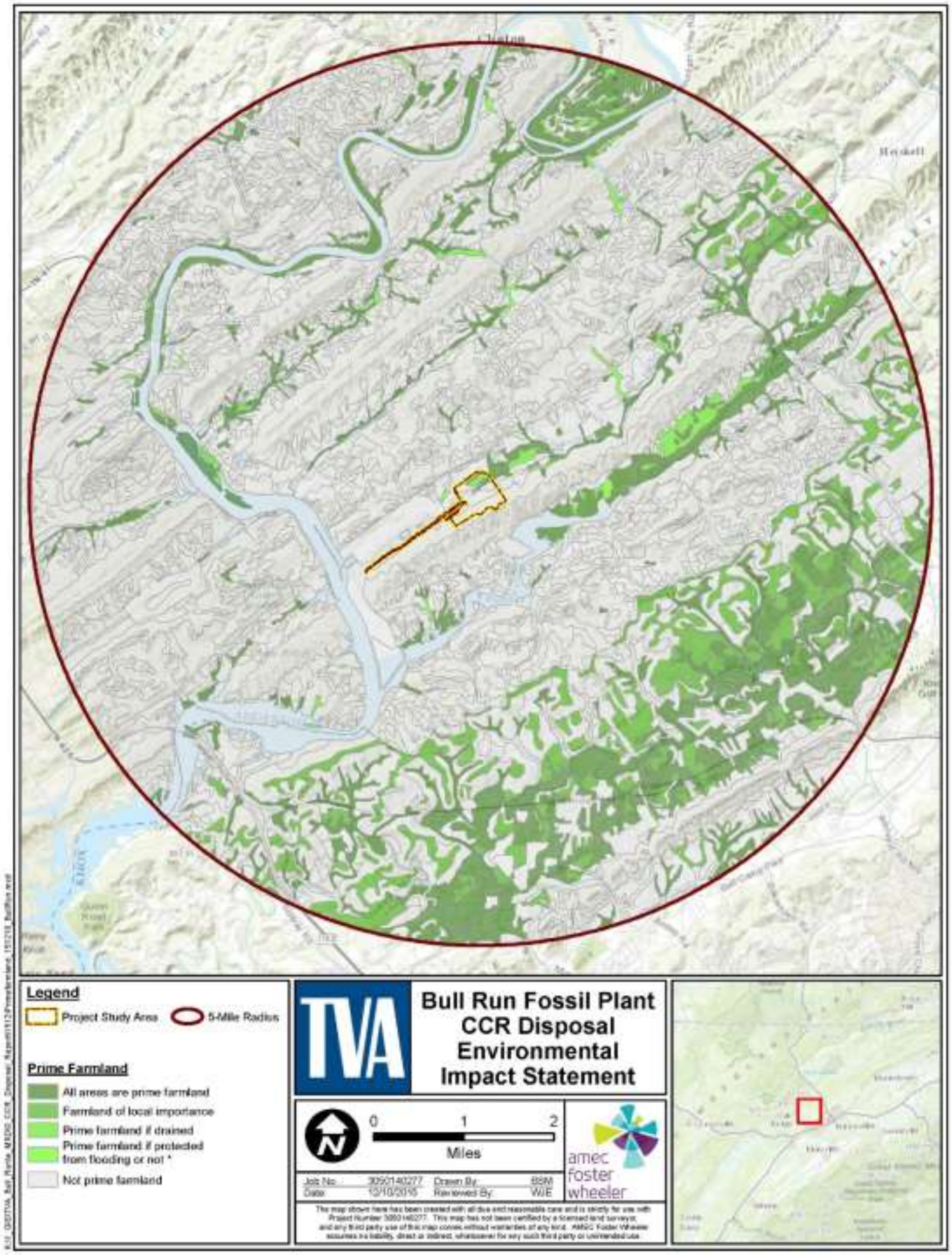


**Figure 3-2. Prime Farmland in the Vicinity of Site J**

#### 3.4.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no impacts to prime farmland under this alternative.

## 3.5 Geology/Seismology

### 3.5.1 Affected Environment

The proposed site is located in the Valley and Ridge Physiographic Province, a northeast-southwest trending series of parallel ridges with elevations up to 3,000 ft and valleys composed of folded and faulted Paleozoic sedimentary rock. The primary geomorphological features are mainly the result of differential weathering of various rock types, which include limestone, dolomite, shale, sandstone and siltstone. Alluvial overburden with variable thickness mantles much of the site and has been derived by flood events of the Clinch River. Larger valleys may have a comparatively thin mantle of alluvial soils ranging in size from clay to coarse sand to boulders. Deeply weathered alluvium in the vicinity of streams and rivers may be found both in low-lying areas and on hills, reflecting the dynamic geologic nature of the province (TVA 2014).

The topographic relief within the project area is approximately 330 ft (Figure 3-3). Surface elevations at the site grade downward to the southwest (4 percent grade) with elevations ranging from 880 ft above mean sea level (ft msl) near Old Edgemoor Lane to 850 ft msl along Worthington Branch. From Worthington Branch, the elevation grades upward to the southeast (6 percent grade) to 905 ft msl at which point the grade increases significantly up the slope of Bullrun Ridge (35 percent grade) to the highest point of the site (approximately 1,180 ft msl).

#### 3.5.1.1 Geology

##### 3.5.1.1.1 Bedrock Stratigraphy

TVA performed a hydrogeologic investigation of the site in 2014 (TVA 2014). The results of the investigation indicate that the site is underlain by topsoil and surface road gravel. This material overlies fill material consisting of dry to moist clay with small amounts of organics, sand and rock fragments. Colluvial deposits which consist of heterogeneous, unconsolidated, fine-grained native soil deposits transported from upper to lower elevations by means of gravity and/or surface water wash underlie the fill material.

Bedrock in the project area consists of various units of the Chickamauga Formation which consist of gray, mostly fine to medium-grained, thin to medium-bedded, in part shaly and nodular limestone. The geologic formations encountered during the 2014 hydrogeologic investigation (TVA 2014) are, in descending stratigraphic order, Conasauga Group (Cc), the Rome Formation (Cr) and Ordovician Chickamauga Limestone (Och).

##### 3.5.1.1.2 Geologic Hazards

U.S. Geological Survey (USGS) information and geologic studies carried out by TVA indicate that the proposed site and surrounding area is known to be subject to minor to moderate seismic events; faulting and karst topography are common to the area.

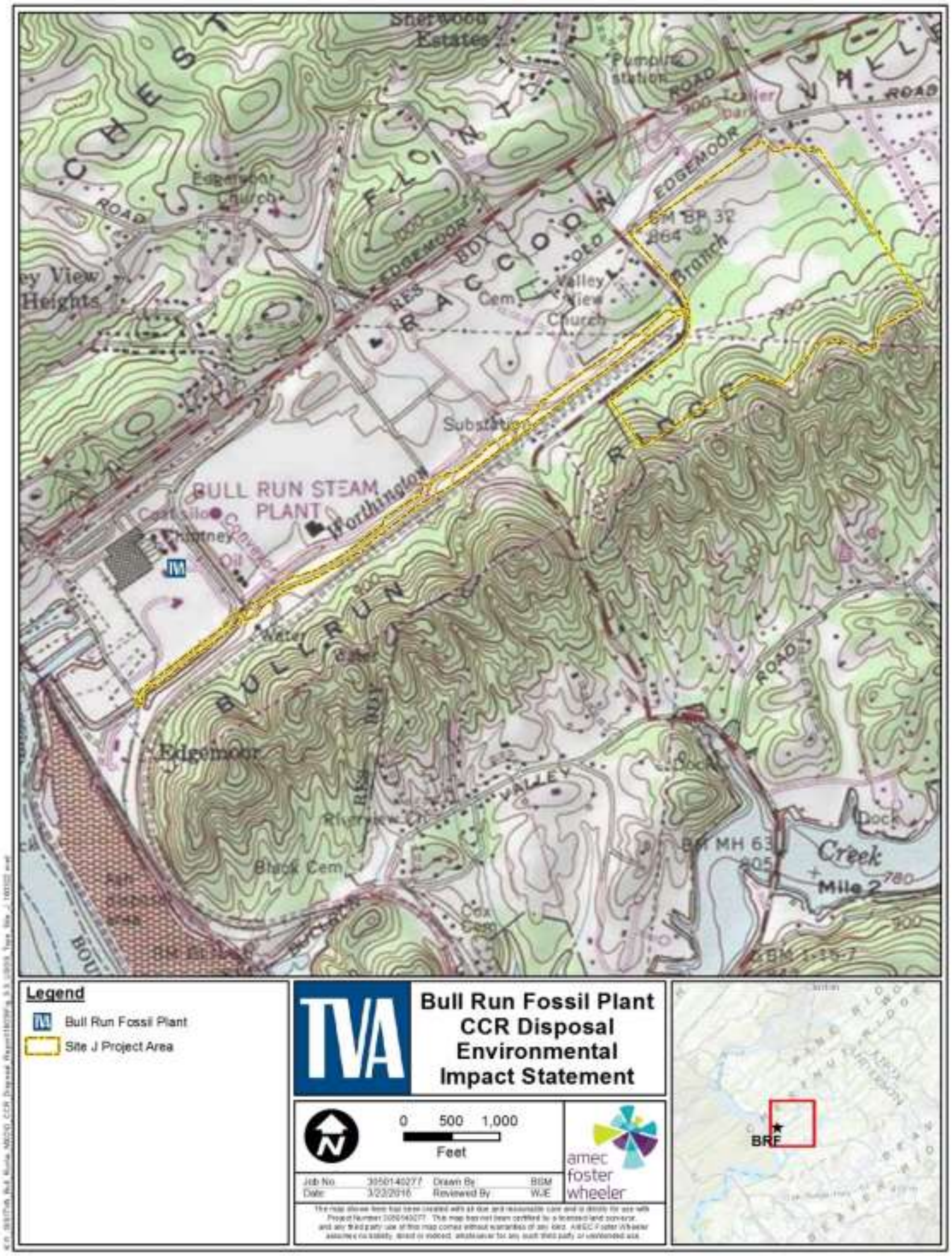


**Figure 3-3. Topographic Map of Site J and the Surrounding Area**

#### 3.5.1.2 Seismic Events

Seismic events affecting eastern Tennessee, which includes the area within the vicinity of BRF, primarily emanate from three zones of earthquake activity: the (1) New Madrid Seismic Zone (NMSZ), (2) Southern Appalachia Seismic Zone (SASZ) and (3) South Carolina Seismic Zone (SCSZ). The most active zone of the SASZ, the East Tennessee Seismic Zone (ETSZ), extends from northwestern Georgia through east Tennessee and is situated in close proximity to the plant. However, most earthquakes emanating from this zone are relatively low in magnitude, with the largest known event in the ETSZ registering a magnitude of 4.6, suggesting a moderate risk of damage from a seismic event. In contrast, if a large earthquake were to occur within the New Madrid zone to the west, damage to East Tennessee would be possible. The Geologic Hazards Map of Tennessee – Environmental Geology Series No. 5 developed and published by the TDEC, Division of Geology and compiled by Robert Miller (1978) shows the plant to be located in Seismic Risk Zone 2 on a scale of 1 to 5 with Zone 5 being the most active risk of seismic activity.

Potential Peak Ground Acceleration (PGA) for the proposed landfill site and vicinity based on 2014 USGS data is shown on Figure 3-4 (USGS 2014). The PGA values for the 2014 USGS map are provided for a reference soft rock condition and values are adjusted based on site classification (hard rock, rock, dense soil/hard rock, etc.). For sites that lie within zones that exceed 0.1 gravitational pull (g), or for which adjusted values based on site conditions exceed 0.1 g, additional analysis is required to demonstrate that all structural components are designed to withstand seismic events. The PGA for the proposed site is 0.3 g.

<u>Faults</u>

Based on a review of the USGS website which contains information on faults and associated folds in the United States that are believed to be sources of magnitude >6 earthquakes during the Quaternary Period (the past 1,600,000 years including Holocene Epoch), there are no known faults of this age located near the area of the proposed site (USGS 2014).

<u>Karst Topography</u>

“Karst” refers to a type of topography that is formed when rocks with a high carbonate ($CO_3$) content, such as limestone and dolomite, are dissolved by groundwater to form sink holes, caves, springs and underground drainage systems. Karst features such as sinkholes and springs are numerous in the Valley and Ridge province and as such Site J is located in an area known to contain karst terrain. However, no significant voids or sinkholes were encountered during drilling within the landfill footprint and there are no caves present on the proposed Site J landfill (TVA 2014).

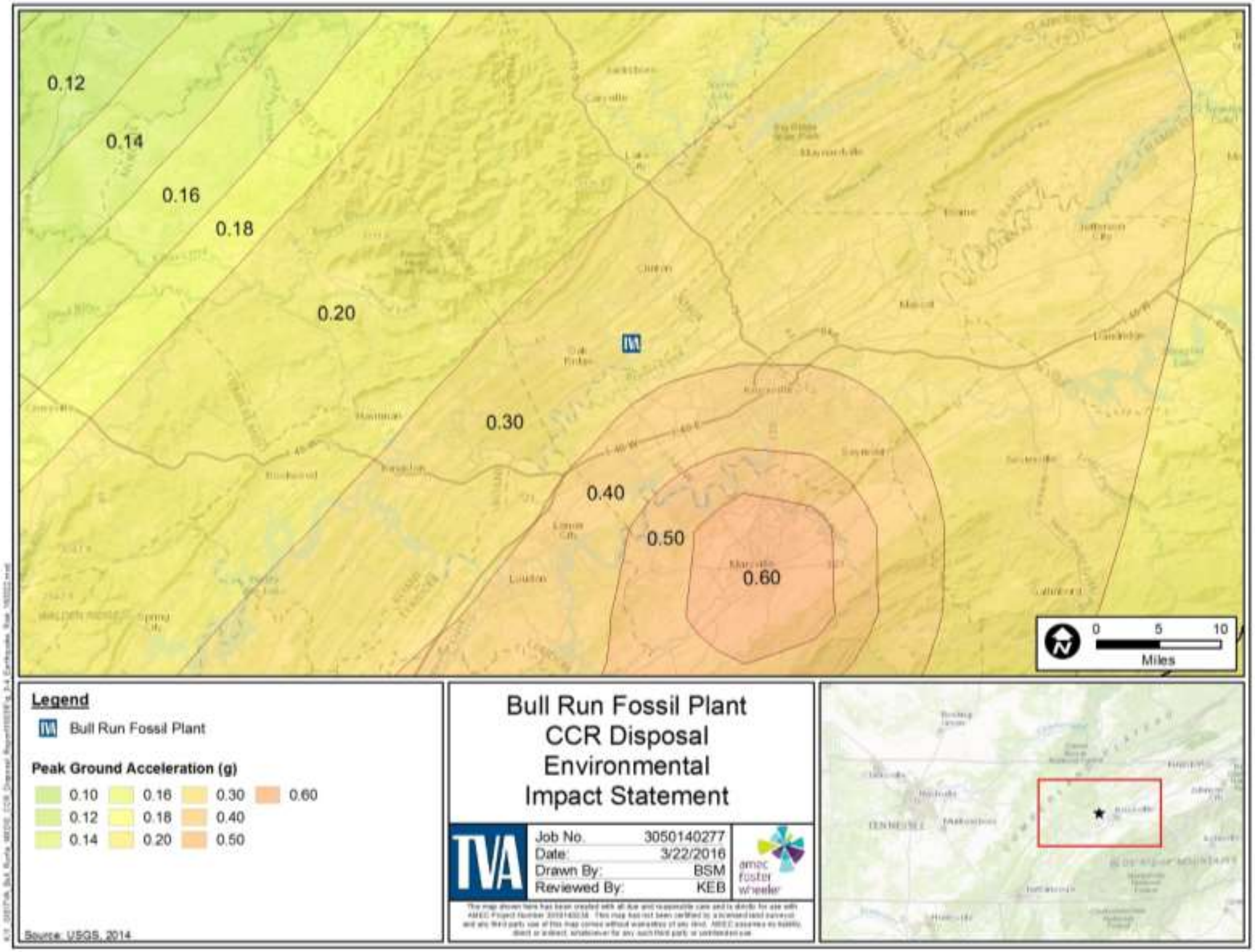


**Figure 3-4. Seismic Peak Ground Acceleration Factors in the Vicinity of the Site J**

### 3.5.2 Environmental Consequences

#### 3.5.2.1 Alternative A – No Action

Under the No Action Alternative there would be no ground-disturbing activities and therefore no impacts to geology and soils would occur.

#### 3.5.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

3.5.2.2.1 Construction Impacts

Construction of the proposed landfill and haul road would involve ground disturbing activities that would include grubbing, grading and excavation. In addition, relocation of Worthington Branch could involve controlled blasting. Soil excavations, removal of vegetation, grading and construction activities have the potential to disturb soil stability and increase erosion. Despite this, impacts to soil resources associated with surface disturbances related to the proposed construction, excavation, blasting, clearing and grubbing activities are expected to be minor, as BMPs outlined in the Storm water Pollution Prevention Plan designed to minimize erosion during land clearing and site preparation would be implemented.

3.5.2.2.2 Operational Impacts

There are two general categories of earthquake hazards: primary and secondary. Primary hazards include fault ground rupture and strong ground shaking. If an earthquake is larger than about magnitude 5.5, ground rupture may occur on the fault. The amount of displacement generally increases with the magnitude of the earthquake. Structures located on a fault can be displaced or damaged by fault ground rupture. The best mitigation for potential fault ground rupture to structures is to accurately locate the fault and set back structures a safe distance from the fault. Where structures and other facilities cannot be located to avoid faults, there are several geotechnical and structural design measures that can be implemented to mitigate the potential for fault ground rupture.

Secondary hazards include liquefaction/lateral spreading, landsliding and ground settlement. Liquefaction is essentially loss of strength in generally granular, saturated materials including alluvial and fluvial deposits subjected to ground shaking. Liquefaction can result in ground settlement, and where there is a free face such as a river bank, can result in ground spreading toward the free face. Liquefaction can damage foundation, pavement and pipelines and underground utilities, and can be mitigated if present by various geotechnical and structural design measures including ground improvements and foundation design. Earthquake-induced landsliding can occur where landslides are present or where colluvial deposits or unstable materials are present on slopes. Potential landslides can be mitigated, if present, with adequate siting and with various geotechnical and structural design measures. Ground settlement can occur in soft, weak materials including non-engineered fill, due to ground shaking, and can be mitigated, if present, by various geotechnical and structural design measures, including ground improvements and adequate foundation design.

Based on the USGS website information, there are no known faults of this age located within 200 ft of the proposed site (USGS 2014). Therefore, the potential for surface fault rupture at the proposed landfill site is considered to be low.

Pursuant to the CFR Title 40 Part 257.53: Criteria For Classification of Solid Waste Disposal Facilities and Practices, seismic impact zone means an area with a 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. The general 2014 USGS map indicates that the proposed Site J is in an area where this standard would be exceeded. Site-specific analysis suggests that Site J will be designated Seismic Site Class D, as defined in the American Society of Civil Engineers Standard (ASCE 2013). Consequently, the disposal facility has been seismically designed to withstand a probabilistic earthquake.

On-site and local geologic and geomorphic features within and around the proposed landfill’s footprint were evaluated during the hydrogeologic investigation of the proposed landfill site. This investigation indicated that native soils do not meet any of the criteria for liquefaction to be induced; therefore, the site is not likely to be susceptible to liquefaction. Settlement within most areas of the disposal facility averaged 13 inches under anticipated loading conditions. Based on the design of the facility, the underlying soil conditions do not indicate that construction of the landfill will result in significant differential settling.

Although, the investigation revealed no karst features within the disposal facility’s footprint, a sinkhole contingency plan has been developed to address unforeseen subsurface karst features if encountered during construction of the disposal facility.

#### 3.5.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge Landfill)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill, the Chestnut Ridge Landfill. Since this is an existing permitted landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative. Therefore, there would be no impacts at the BFR site.

The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Therefore, any resources along the haul route are already subjected to vehicular traffic destined for the landfill and no new roads would need to be constructed.

## 3.6 Groundwater

### 3.6.1 Affected Environment

Groundwater in the aquifer system of the Valley and Ridge physiographic province occurs primarily in a shallow flow system of bedrock fractures. These fractures are highly irregular in their distribution throughout the solid rock mass and generally occur within 300 ft of the land surface (Brahana et al. 1986).

Groundwater underlying BRF is derived from infiltration of precipitation and from lateral inflow along the northwest boundary of the reservation. Data from past investigations and sampling at Site J indicates Worthington Branch and Clinch River/Melton Hill Reservoir are the principal receptors of shallow groundwater flow from the plant area.

TVA conducted a comprehensive hydrogeologic investigation of Site J in two phases between January 2012 and June 2014. These studies indicate that the uppermost aquifer on Site J consists of water found within fractures or voids in the bedrock. Groundwater perched in unconsolidated materials was found on the north side of Worthington Branch. Evidence of perched groundwater was identified by seepage and by high water levels in selected wells in the area. Groundwater also occurs within the uppermost bedrock where fracturing and weathering allows for storage and movement of water. The bedrock groundwater zone is therefore limited by the extent of weather and fracturing which result in an irregular depth and thickness of the aquifer (TVA 2013). Groundwater flow is generally in a downhill direction towards Worthington Branch and then down valley to the southwest. Groundwater on-site was observed through the installation of borings and monitoring wells, and the observation of wetlands, wet-weather conveyances/intermittent streams, ponds, ephemeral seeps and Worthington Branch. Notable groundwater related features identified on Site J include:

- Two farm ponds were located on the north side of Worthington Branch. Water levels in the two farm ponds fluctuated relatively little over the course of the year, so it is believed that they may have been fed by shallow groundwater in addition to their small surface water catchment areas. These ponds were breached sometime between 2013 and 2014 and currently have man-made ditches that drain the former pond areas into Worthington Branch. In addition, two minor drainages located on the southeast and southwest edges of Site J flow into Worthington Branch. Both of these drainages were considered wet weather conveyances as they were dry within 48 hours of a rain event and did not exhibit stream characteristics. However, during a subsequent survey, a groundwater connection was established and macroinvertebrates were observed in both drainages and a hydrologic determination indicated that 103 and 160 ft respectively of each of these drainages met the characteristics of a stream.
- Several ephemeral seeps were identified on site. Two seeps located on the north side of Worthington Branch drain relatively shallow groundwater. The eastern of the two is located at the corner of a wet meadow area and seeps only during the wet season. The western is located in a minor drainage channel on the west side of the project site. Adjacent to the south side of Worthington Branch, four seeps emanate from soil pipes when groundwater levels are relatively high.
- One wet weather spring emanates from a cavity in a bedrock exposure in the middle of the lower slope of the southern hillside. This spring discharges groundwater during very high flow times and also acts as a sink for surface runoff when groundwater levels are low.

#### 3.6.1.1 Groundwater Use

A water supply survey was performed as part of the 2014 hydrogeologic investigation of Site J to determine public water supply sources within a 2-mi radius of the site (including water intakes, water treatment plants and public supply lines) and private water supply sources (e.g., springs and wells) within a 1-mi radius of the site (TVA 2014). There are no domestic wells on Site J. There are seven domestic wells within 1 mi of the site; two of the wells are located downgradient of the site. Well depths are unknown, but it is likely that most wells yield water at a relatively shallow depth in the Chickamauga Formation. Public water service is provided to the areas surrounding the site by the Hillsdale-Powell Utility District, which withdraws water from Bullrun Creek approximately 0.8 mi southeast of the Site J and the West Knox Utility District, which withdraws water from the confluence of Bullrun Creek and the Clinch River.

#### 3.6.1.2 Groundwater Quality

The chemical composition of groundwater on the site was evaluated through four sampling events between March 2012 and June 2014 in which groundwater and surface water samples were collected. A total of 67 samples were collected from 22 wells and four surface water sample sites. The samples were tested for a suite of inorganic parameters to evaluate natural influences on the baseline chemistry of upgradient and downgradient groundwater so that these influences may be accounted for in future monitoring. Applicable primary drinking water standards (health-based standards) were exceeded for nitrate at one well in October 2013 and the standard for antimony was exceeded at two surface water sites sampled in March 2012. Secondary drinking water standards were exceeded for dissolved solids, iron, manganese and sulfates at several of the sample sites. These primary and secondary drinking water exceedances are common conditions for the relatively shallow groundwater found in this geologic environment and in close proximity to rural residential and agricultural land use.

### 3.6.2 Environmental Consequences

#### 3.6.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the dry fly ash stack for as long as capacity is available. There would be no change in existing CCR disposal operations and therefore no impacts to groundwater are anticipated. The dry fly ash stack will ultimately be closed under this alternative. Closure will be in accordance with applicable state and federal requirements, and impacts to groundwater are not anticipated.

#### 3.6.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

In accordance with TDEC requirements, the proposed landfill design will incorporate a composite liner system that meets Federal Subtitle D Resource Conservation and Recovery Act regulations performance standards ($1x10^{-7}$) permeability. As described in Chapter 2, the liner system will utilize a synthetic liner in combination with a compacted clay liner. The landfill design will incorporate requirements designed to reduce groundwater impacts including a storm water management system, leachate migration control standards, karst remediation (if necessary), a geosynthetic cap system and a groundwater monitoring program as required by TDEC Rule 0400-11-01 and as specified by permit requirements. BMPs would be used to control sediment infiltration from storm water runoff during all construction phases of the project.

It is anticipated that construction and operation of the proposed landfill site will not have a notable impact to groundwater as the new landfill would be required to maintain a liner system as well as an engineered cap to mitigate groundwater flow through the materials. Therefore, with the use of BMPs and adherence to TDEC requirements, minimal impacts to groundwater from the proposed action are expected.

#### 3.6.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to groundwater resources that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to groundwater are expected to occur with this alternative.

## 3.7 Surface Water

### 3.7.1 Affected Environment

The Clinch River is a primary surface water drainage feature of Anderson County and parts of eastern Tennessee. Natural flow of the Clinch River is regionally to the southwest towards its confluence with the Tennessee River. However, because of the meandering nature of the river, flow is from the northwest to the southeast adjacent to BRF and then to the west a short distance downstream of BRF. Two impoundments, Norris and Melton Hill Reservoirs, are located on the Clinch River. Located at CRM 48.0, BRF is 31.8 river miles downstream from Norris Dam and 24.9 river miles upstream of Melton Hill Dam. Flow in the Clinch River in the vicinity of BRF is dependent upon releases through the hydroelectric plant at Norris Dam and releases from Melton Hill Dam. An arm of Melton Hill Reservoir is present within the Bullrun Creek drainage, south of the project area. At CRM 48.0, the Clinch River drainage area is approximately 3,090 square mi.

The latest TDEC 303(d) report (TDEC 2014) states that chlordane, polychlorinated biphenyls (PCB), mercury, *E. coli*, loss of biological integrity due to siltation, physical substrate habitat alterations, habitat loss due to alteration in stream-side or littoral vegetative cover, arsenic, strontium, cesium, biological loss due to undetermined cause and oil and grease contamination have all been found as factors that impact the integrity of the Clinch River. This contamination is due to contaminated sediment, the presence of a site subject to regulation of Comprehensive Environmental Response, Compensation, and Liability Act, pasture grazing atmospheric deposition, industrial point source, channelization, industrial permitted runoff, discharges from municipal separate storm sewer areas and municipal urbanized areas. The Clinch River in Anderson County, upstream of BRF, is also listed for temperature and flow alterations due to upstream impoundment (Norris Dam).

TVA has taken action to improve water quality and flows within its reservoirs. Most notably, TVA monitors the ecological condition of its reservoirs as part of the Vital Signs Monitoring Program (http://www.tva.gov/environment/ecohealth/index.htm), which was initiated by TVA in 1990. Reservoirs throughout the Tennessee Valley have been monitored for physical and chemical characteristics of waters, sediment contaminants, benthic macroinvertebrates (bottom-dwelling animals such as worms, mollusks, insects and snails living in or on the sediments) and fish community assemblage. Five key indicators (i.e., dissolved oxygen [DO], chlorophyll, fish, bottom life, and sediment contaminants) are monitored and contribute to a final rating that describes the "health" and integrity of an aquatic ecosystem. The reservoir ecological health evaluation system is reviewed each year, and improvements needed to address problems are identified. These improvements include installing equipment to add oxygen to the water as it flows through dams and adjusting reservoir flows.

The Site J project area and the Chestnut Ridge Landfill are located within the Lower Clinch River Watershed, Hydrologic Unit Code 06010207. Worthington Branch, a small direct tributary to the Clinch River/Melton Hill Reservoir is the primary drainage feature of the Site J project area (Figure 3-5). Worthington Branch flows through Site J and continues westerly along the southern side of BRF, discharging to the Clinch River via the same outfall as BRF permitted Outfall 2 which is the condenser cooling water outlet. The condenser cooling water flow is approximately 565 MGD, or 870 cubic ft per second (cfs). The Worthington Brach watershed is located within the 0103 sub-watershed (12-digit Hydrologic Unit Code). A search of the U.S. Geological Survey (USGS) and EPA Storet databases found no water quality samples for Worthington Branch. There have been no known water quality investigations at Worthington Branch.

Bullrun Creek is listed as impaired because of elevated levels of *E. coli* that are attributed to pasture grazing, collection system failure and discharges from a Metro Water Services MS4 Program area (TDEC 2014).

Worthington Branch is not identified as an impaired waterbody on the Proposed Final 303(d) List (TDEC 2014). Upstream of Melton Hill Dam, the Clinch River and Melton Hill Reservoir are classified as a State Scenic River (Class III – Developed River Area) (TDEC 2015).

Regionally, three Total Maximum Daily Load (TMDL) studies have been completed for the Lower Clinch River watershed. There are watershed TMDLs for pathogens, for siltation and habitat alteration and for PCBs and chlordane in Melton Hill Reservoir. Based on CCR landfill activities, the siltation and habitat alteration TMDL may be the most relevant of the TMDLs established. Foster Branch and Williams Branch, streams appearing to be similar to Worthington Branch based on land use and topography, and nearby tributaries to Bullrun Creek, are or have been 303(d) listed impaired streams for siltation and habitat alteration.

#### 3.7.1.1 Hydrology

Worthington Branch has had significant rerouting and channelization from its original course through BRF in the past by previous plant activities. In addition, the portion of the stream that bisects the proposed landfill site has been channelized by a previous property owner. Worthington Branch is classified as a perennial stream and generally flows from northeast to southwest toward its confluence with the Clinch River approximately 1.8 mi west of Isabella Lane. Upstream of the project area, the channel passes through a small residential area along Greendale Lane. Soon after entering the project area, Worthington Branch flows through a corrugated metal culvert beneath Isabella Lane. Between Isabella Lane and New Henderson Road, Worthington Branch is shallow, linear, intermittent channelized stream and has poorly to moderately vegetated banks. The stream continues southwest through culverts under New Henderson Road into a forested area between the existing dry fly ash stack and a rail line, while remaining roughly parallel with the rail line. The stream flows southwest along the rail line and through a box culvert under an access road continuing outside the project area toward its confluence with the Clinch River, approximately 1.8 mi west of Isabella Lane.

The Worthington Branch drainage area at the upstream (near Isabelle Lane) and down-stream (at New Henderson Road) boundaries of the site are 200 and 295 ac, respectively. Worthington Branch continues southwesterly from the site along the southern edge of BRF to the Clinch River. Near the outlet to Clinch River, the Worthington Branch drainage area is 2.2mi$^2$ (1,410 ac) according to the USGS StreamStats web-based program (Ladd and Law 2007). The stream profile slope in the vicinity of Site J is approximately 0.0075 ft/ft, falling from approximately 855 ft to 839 ft (16 ft), over a distance of approximately 2,140 ft. At more than 40 ft above the Clinch River 100-year flood elevation of 797 ft, Site J is not subject to flooding from the Clinch River.

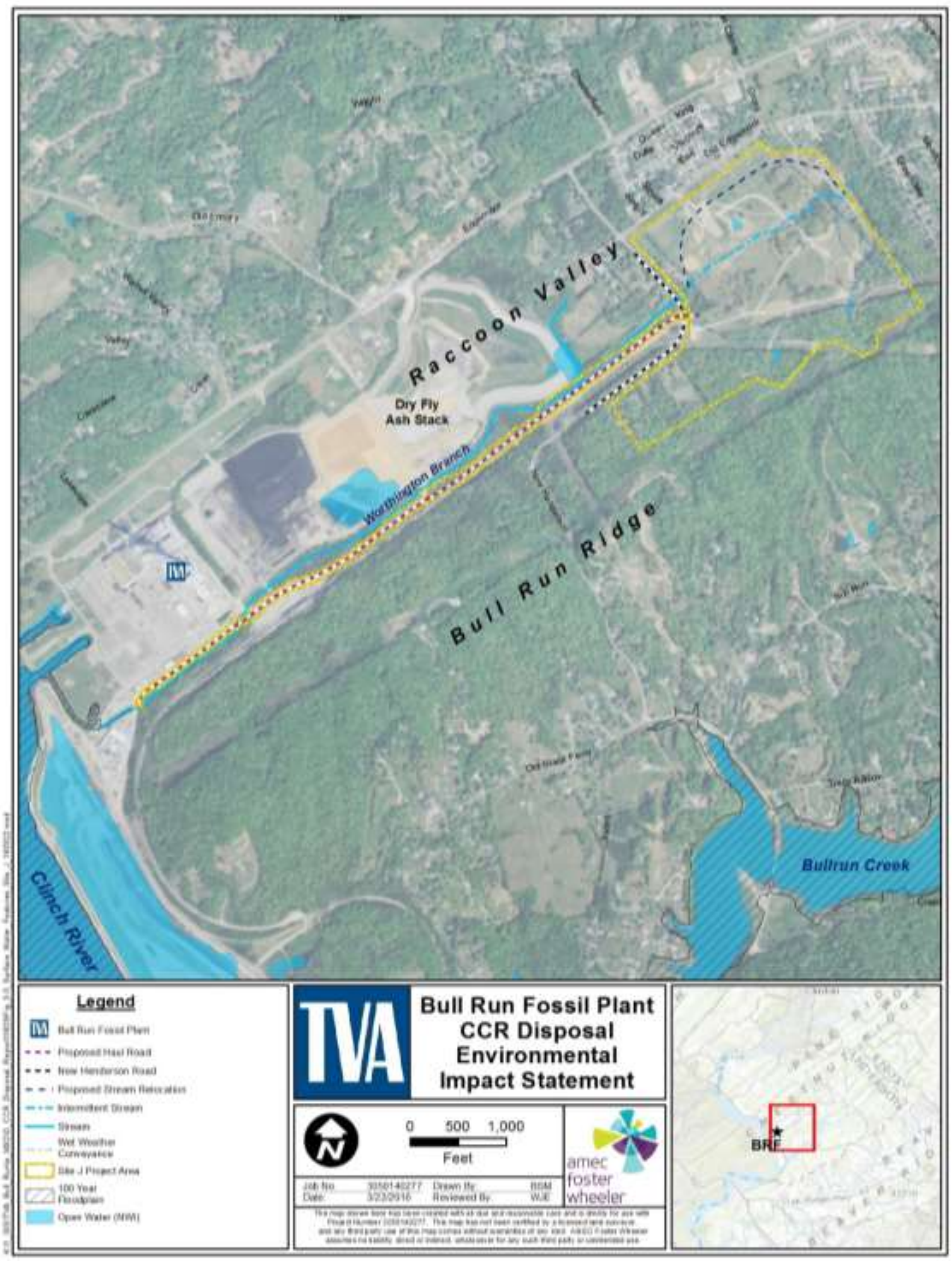


**Figure 3-5. Surface Water Features – Site J and the Surrounding Area**

TVA completed a reconnaissance level assessment of Worthington Branch within the Site J project area in January 2012 (TVA 2012). The assessment included a classification of the surface runoff conveyances at Site J to determine if they are classified as “streams” or as “wet-weather conveyances” according to TDEC methods (Hydrologic Determination Field Data Sheet). The assessment concluded that two minor drainages flow into Worthington Branch. These are located on the southeast and southwest edges of Site J (see Figure 3-5). Both of these drainages were considered wet-weather conveyances as they were dry within 48 hours of a rain event and did not exhibit stream characteristics. However, during a subsequent survey, a groundwater connection was established and macroinvertebrates were observed in both drainages and a hydrologic determination indicated that 103 and 160 ft respectively of each of these drainages met the characteristics of a stream.

In addition to the streams and runoff conveyances at the site, two small man-made ponds were located on the north side of Worthington Branch. As identified in Section 3.6 (Groundwater), water levels in the two farm ponds located on the site fluctuated relatively little over the course of the year. The impounding berms of these two ponds were breached in 2014, and currently both ponds have man-made ditches that drain into Worthington Branch. It is believed that the ponds may have been fed by shallow groundwater in addition to their small surface water catchment areas.

Surface runoff in the region is typically about 1.35 cubic ft per square mi, or 18 inches per year. However, small streams with long-term runoff data in the region show highly variable runoff rates, presumably influenced by groundwater discharges. The average annual precipitation at Oak Ridge, west of the project area, is 50.9 inches (National Weather Service 2015). Precipitation depth, duration and frequency data for the area (National Oceanic and Atmospheric Administration [NOAA] 2004) are summarized in Table 3-3.

**Table 3-3. Precipitation Depth Duration Frequency Data for the Project Site**

| **Duration** | **Precipitation Depth (inches) for Given Average Recurrence Interval (year)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **5** | **10** | **25** | **50** | **100** | **500** |
| **60-min** | 1.13 | 1.36 | 1.70 | 2.00 | 2.42 | 2.78 | 3.17 | 4.20 |
| **6-hr** | 1.79 | 2.13 | 2.60 | 3.01 | 3.60 | 4.11 | 4.65 | 6.04 |
| **24-hr** | 2.74 | 3.27 | 3.99 | 4.59 | 5.44 | 6.14 | 6.88 | 8.80 |
| **2-day** | 3.33 | 3.98 | 4.87 | 5.59 | 6.61 | 7.44 | 8.32 | 10.5 |
| **7-day** | 4.67 | 5.57 | 6.72 | 7.61 | 8.80 | 9.72 | 10.7 | 12.9 |
| **20-day** | 7.46 | 8.82 | 10.3 | 11.4 | 12.8 | 13.8 | 14.8 | 17 |
| **30-day** | 9.19 | 10.8 | 12.4 | 13.6 | 15 | 16 | 17 | 19 |

The StreamStats program includes a method to provide statistically based low flow characteristics as well as flood flows. The method included in StreamStats has a lower bound on drainage area that precludes application to Worthington Branch at the project site. A more recent USGS investigation (Law et al. 2009) can be applied using input information generated by StreamStats. Selected streamflow characteristics for Worthington Branch generated by StreamStats and by the more recent method are summarized in Table 3-4.

**Table 3-4. Low Flow and Flow Duration Estimates for Worthington Branch**

| Flow Parameter (cfs/inches) | Downstream (West) of Site J (0.46 mi$^2$) | Outlet to Clinch River (2.2 mi$^2$) | |
|---|---|---|---|
| | Region of Influence Method | Region of Influence Method | Regional Regression Method |
| 10-Year, 7-Day Low Q | 0.04 | 0.26 | 0.10 |
| 5-Year, 30-Day Low Q | 0.07 | 0.38 | 0.17 |
| Mean Annual Flow | 0.72 / 21.2 | 3.7 / 22.8 | 3.0 / 18.5 |
| Mean Summer Flow | 0.32 / 9.4 | 2.1 / 13.0 | 1.2 / 7.6 |
| Annual 90% Exceed. | 0.08 | 0.52 | 0.24 |
| Annual 50% Exceed. | 0.29 | 1.8 | 1.2 |
| Annual 10% Exceed. | 1.62 | 8.0 | 6.8 |

Source: NOAA 2004

The Clinch River drainage area at BRF is approximately 3,090 mi$^2$. The USGS operated streamflow Station 03538150, Clinch River near Oak Ridge, from 1937 through 1968 during which time the average annual flow rate was 4,570 cfs. The drainage area at that station is 3,385 mi$^2$, or approximately 10 percent larger than the drainage area at BRF.

There are several existing wastewater streams at BRF permitted under NPDES Permit TN0005410. Because the Outfall 001 location is the primary outlet potentially affected by the proposed project, it is the only existing BRF wastewater stream discussed here. About 8.83 MGD of effluent is discharged to Clinch River via NPDES Outfall 001. Outfall 001 discharges from the Stilling Pond located along the northern bank of the end of the Bullrun Creek arm and at approximately CRM 46.6. Discharges from the site would include station sumps, leachate, outage washes, flue gas desulfurization discharge water, minimal low volume wastewater flows and some process and non-process storm water driven flows. However, due to activities associated with the closure of the ash impoundments at BRF, changes in discharge flow would be likely as a result of that project (TVA 2016).

## 3.7.2 Environmental Consequences

### 3.7.2.1 Alternative A – No Action

No significant changes to surface water resources are anticipated under the No Action Alternative.

### 3.7.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

#### 3.7.2.2.1 Construction Impacts

Construction of the landfill and haul road at the project site according to the proposed plan would require realigning the Worthington Branch channel from the eastern site boundary to the western site boundary to provide a larger landfill waste disposal area. The total disturbed area at Site J would be approximately 119.9 ac. Construction of the haul road to transfer CCR materials from the plant to Site J would require approximately 1.37 mi of new roadway, including a 40-ft wide pavement. The new haul road impacted area is approximately 14.8 ac, increasing the total project impact area to approximately 134.7 ac. Approximately 1,321 ft of Worthington Branch would be impacted by the proposed haul road.

Approximately 2,158 linear ft of Worthington Branch and its tributaries would be relocated to an excavated 2,700-ft long channel to the north (see Figure 3-5). That channel would require excavation to depths of up to approximately 30 ft and much of the excavation would be likely be in rock. The new channel is entirely off-line from the existing channel and can be constructed without water flow through the channel until the connection is made to the existing channel at the upstream end. Provisions would be taken to prevent flood water flow into or through the new channel and discharge of pollutants in the event of a large runoff event. Construction of the haul road would encroach into the Worthington Branch channel at one or more locations. TVA has coordinated with TDEC and U.S. Army Corps of Engineers (USACE) and has proposed mitigation for these areas through payment to an appropriate stream bank and/or restoration on-site. All applicable ARAP and USACE 404 permits would be obtained and mitigation prescribed by the terms and conditions of these permits would be followed.

There is potential for increased runoff during construction of the landfill (i.e., initial excavation and liner construction prior to beginning placement of CCR in the landfill). BMPs for erosion and sediment control, as well as all types of construction site pollution prevention, would be employed to control soil erosion and rock excavation dust which would minimize these temporary impacts.

##### 3.7.2.2.2 Operational Impacts

Hydrology/Surface Runoff Rate and Volumes

Construction of the landfill would include a cover system for isolation of the CCR. The final cover system would be constructed when the fill reaches the final planned elevation. Prior to reaching final grades, runoff from the active filling area, which would have potentially contacted CCR, would be collected and directed into the leachate collection system. Runoff that is non-CCR contact runoff (not potentially contacting CCR materials) would be directed into one of the on-site storm water sedimentation ponds which discharge to Worthington Branch. Storm water potentially contacting waste materials at the active fill placement area would be minimized by use of diversions, temporary covers and pumps (TVA 2015e) to control flows and prevent contact which discharge to Worthington Branch. Worthington Branch ultimately flows to the Clinch River through NPDES Outfall 002 which is the permitted outfall for the BRF condenser cooling water. Leachate and storm water that may have contacted CCR materials would be handled separately from non-contact storm water and would be pumped to the existing treatment system prior to discharge through NPDES Outfall 001.

The final cover would be installed in phases and would minimize percolation of water from the cover into the underlying CCR. Because the bedrock is near the surface at the project site and runoff is relatively high in the region (i.e., approximately 18 inches per year), a cover with a low percolation rate would not significantly change the runoff conditions. Rock-lined letdowns would convey surface water run-off to perimeter channels and catch basins at the base of the disposal facility.

As described above, surface water runoff would be collected in three sediment basins located on the west, south and northeast sides of the landfill cells. The ponds located on the west side and northeast sides of the disposal facility would be incised ponds created by excavation into existing ground. The south pond would require construction of an embankment in the existing valley area and would be lined with a flexible membrane liner to prevent seepage into the subsurface below the landfill. Water would be discharged from the south pond by a directionally drilled culvert, and storm water would be conveyed from south of the soil embankment to the east side of the landfill.

The basins would be designed to detain at least a 25-year/24-hour storm and control flow resulting from a 100-year/24-hour storm so that storm water is discharged through a combination of the primary and the emergency spillway culverts to the relocated Worthington Branch.

The realigned segment of Worthington Branch (see Appendix C) would be constructed in accordance with permit requirements. The constructed channel would include a low flow channel and narrow bench, or floodplain terrace, bordering the channel, but would not provide the width of overbank floodplain storage as the existing channel. However, the length of the realigned channel would be slightly longer than the existing channel. Combined with the detention provided in the two storm water ponds for on-site runoff, no significant change in runoff rates would occur. Additionally, the realigned channel would be sized to prevent an increase in flood levels upstream of the site.

Water Quality

Storm water that does not have contact with CCR would be discharged from the two storm water detention and settling ponds into the re-located segment of Worthington Branch and from there it would flow a distance of approximately 1.6 mi through the existing Worthington Branch to existing BRF Outlet 002. Discharge would meet all permit requirements. Mitigation measures would be implemented should the process not meet permit requirements.

During landfill operations, CCR materials being conveyed and placed at the landfill face would be subject to erosion by wind and water flow. Materials eroded by wind may be deposited directly into waters or on surfaces with subsequent potential for erosion and transport to waters. Wind erosion may be effectively controlled by sufficient moisture content in the transported and handled CCR materials and employing dust control activities. Where CCR materials are exposed to direct precipitation or surface runoff, other means of control may be employed such as temporary covers of CCR materials, maintenance of a working area of approximately 10 ac and runoff diversions to minimize runoff volume that has potentially contacted CCR. The contained runoff would be directed to the leachate collection system where it would be pumped to the plant treatment system prior to discharge to the settling pond and eventual discharge via plant NPDES Outfall 001.

BMPs for prevention of pollutant discharge to surface waters would be applied throughout landfill operations to minimize generation of storm water. BMPs to be employed include non-structural and structural practices to minimize risk of pollutant release and transport by runoff and wind.

Leachate would be handled separately from storm water. Construction of the landfill and CCR material placement is anticipated to occur in three landfill cells, or phases. Each cell would have a separate leachate collection system. Leachate would be collected from above the landfill bottom liner and conveyed to a leachate sump. The liner and leachate collection system would be a system that is compliant with, or equivalent to, the TDEC Subtitle D liner design standards. Leachate surge storage would be provided by tanks or a lined leachate pond and leachate would be pumped to the existing on-site treatment system used for the existing dry fly ash stack. Treatment of the leachate would be provided in the leachate treatment system as required to meet discharge quality standards. The treatment system would include sedimentation, neutralization and coagulation in the stilling impoundment located along Clinch River. Discharge would be at Outfall 001 from the settling pond to the Clinch River as identified in the existing NPDES permit.

The leachate collection and discharge rates have been predicted for various stages of landfill operation (Nick Golden, URS, personal communication, December 2014). Average rates range from approximately 24,000 to 53,000 gallons per day (0.037 to 0.082 cfs), depending on stage of construction and plan area of waste placement. Peak daily leachate generation rates are expected to range from approximately 148,000 to 265,000 gallons per day (0.23 to 0.41 cfs).

The leachate would be directed to treatment along with several other wastewater streams, including leachate from the existing dry fly ash stack, prior to discharge at NPDES Outfall 001 at the stilling impoundment. Chemical addition and mixing to facilitate coagulation and settling would occur in the settling impoundment. No new chemical constituents would be introduced to this treatment system that are not already in the existing wastewater streams. The NPDES permit for Outfall 001 is based on an existing condition average day flow of 14.32 MGD (22.1 cfs). As the anticipated leachate flow is less than 0.05 MGD (on average), this would not be considered a significant increase in flow or have a measureable impact on discharge water quality. Operationally, treatment chemical addition is adjusted as needed to meet discharge concentration needs. Notably, the volume of water discharged to the Clinch River at the permitted NPDES outfall has actually decreased since the cessation of fly ash sluicing. The Site J average day leachate generation rate for the development phase with highest flow is only 0.0092 percent of the Clinch River average day flow rate, which is estimated to be 4,450 cfs based on the 90-year long streamflow record at the USGS Station 03533000, Clinch River below Norris Dam located upstream from BRF. Therefore, there would be no measurable change to surface water impacts.

The proposed landfill would meet or exceed all permit requirements, therefore impacts associated with operation and closure of the landfill are not anticipated.

#### 3.7.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill. As this alternative assumes that transport of CCR would be to an existing, permitted landfill, no new roads would be constructed, and there would be no direct impact to surface water resources associated with this alternative. No change to the existing environment within the landfill boundaries are anticipated. Therefore, potential surface water impacts associated with this alternative would primarily be indirect impacts related to the transport of CCR material from BRF to the landfill. These impacts would be realized as a result of increased exhaust and fugitive dust that could indirectly impact surface water resources adjacent to the haul route.

The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic, and no new roads would be constructed. Therefore, surface water resources along the haul route are already subjected to vehicular traffic destined for the landfill. Additional trucks along this route would result in minor increases of fugitive dust and exhaust emissions that could indirectly impact surface water resources along the route due to deposition. However, BMPs such as covered loads, wet suppression and equipment maintenance would be implemented as appropriate to minimize impacts. Therefore, impacts to surface waters along the haul road to Chestnut Ridge are not anticipated.

## 3.8 Floodplains

### 3.8.1 Affected Environment

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a 1 percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2 percent chance of flooding in any given year is normally called the 500-year floodplain.

The project areas for both the proposed BRF landfill location and the Chestnut Ridge Landfill location are not within floodplains mapped under the National Flood Insurance Program (see Figure 3-5). The BRF site is located within the boundaries of Flood Insurance Rate Map number 47001C0245G, May 4, 2009 (Anderson County, Tennessee and Incorporated Areas).

Storm event peak runoff rates for the Worthington Branch watershed can be estimated using the USGS regional regression equations as implemented on the web-based StreamStats program. At New Henderson Road, the regression equations provide a best estimate of 2-, 10- and 100-year return period peak flows of 63, 137 and 260 cfs. Selected precipitation depth-duration-frequency data for the area are summarized in Table 3-3

There is no printed Flood Insurance Rate Map encompassing the Chestnut Ridge Landfill location because there are no special flood hazard areas in that portion of Anderson County, and specifically at the proposed Chestnut Ridge Landfill. The unprinted Flood Insurance Rate Map is number 47001C0260F which can be viewed on Federal Emergency Management Agency's National Flood Hazard Layer at https://msc.fema.gov/portal/search.

### 3.8.2 Environmental Consequences

As a federal agency, TVA is subject to the requirements of EO 11988, Floodplain Management. The objective of EO 11988 is "…to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (United States Water Resources Council 1978). The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. For certain "Critical Actions," the minimum floodplain of concern is the 500-year floodplain.

No impacts to floodplains would occur under the No Action Alternative.

Additionally, because there is no mapped National Flood Insurance Program floodplain at either the BRF location or the Chestnut Ridge Landfill location, neither of the alternatives would result in impacts to mapped floodplains, which would be consistent with EO 11988.

## 3.9 Vegetation

### 3.9.1 Affected Environment

BRF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion of Tennessee (Griffith et al. 2001). Dominated by cherty clay, lands within this ecotype historically supported mixed deciduous/evergreen forest but many lands on gentler slopes have been converted to agricultural uses such as cropland and pasture.

As discussed in Section 3.3 (Land Use), surrounding land use consists of agricultural, residential, rural and commercial activity. Land use/land cover based on National Land Cover data within the project area and within the 5-mi radius of Site J is summarized in Table 3-1. Notably, deciduous forest (56.0 ac) and grassland/herbaceous (46.6 ac) cover types comprise 76 percent of the 134.7 ac within Site J and the haul route. Much of the land within the 5-mi radius is undeveloped and has either remained as undisturbed woods or used for agriculture (Figure 3-6).

Site vegetation was previously described by TVA (TVA 2013). An additional field reconnaissance was conducted within the project area in October 2015 to evaluate the current environmental conditions. Within Site J and the proposed haul road, 53 species of plants were identified. Plants in the herbaceous strata included ruderal species commonly found in agricultural or developed land use areas such as ragweed, partridge pea, mare's tail, Queen Anne's lace, sericea lespedeza and goldenrod. Common shrubs included winged sumac, Chinese privet and bush honeysuckle. In forested areas, common tree species included oaks, eastern redbud and, in the wetland areas, sycamore and pignut hickory (see Section 3.13, Wetlands). Portions of the project area have been more recently disturbed due to the construction and subsequent demolition of residential properties.

Wooded areas consist of a mosaic of mixed evergreen deciduous forests. Forested areas within the southern portion of Site J are better established. Common woody species include American elm, autumn olive, black gum, black locust, boxelder, chestnut oak, eastern red cedar, mockernut hickory, northern red oak, southern red oak, sweetgum, sugar maple, tulip poplar, Virginia pine, post oak, white ash and white oak. Vines such as blackberries, greenbriers, Japanese honeysuckle, multiflora rose, passion flower, poison ivy, summer grape, trumpet creeper, Virginia creeper and wood rose are common (TVA 2013). No unique plant communities are present within the proposed project footprint at BRF.

EO 13112 (Invasive Species) defines an invasive species as one that is not native to the local ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plants can include trees, shrubs, vines, grasses, ferns and forbs. Invasive plants common in and near the project area include autumn olive, bush honeysuckle, Chinese privet, crown vetch, Japanese honeysuckle, Japanese stilt grass, Johnson grass, mimosa, multiflora rose and sericea lespedeza. All of these species have the potential to affect the native plant communities adversely because of their ability to spread rapidly and displace native vegetation.

### 3.9.2 Environmental Consequences

#### 3.9.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, no impacts to vegetation would occur. Accordingly, project-related environmental conditions for vegetation resources in the project area would not change under the No Action Alternative.

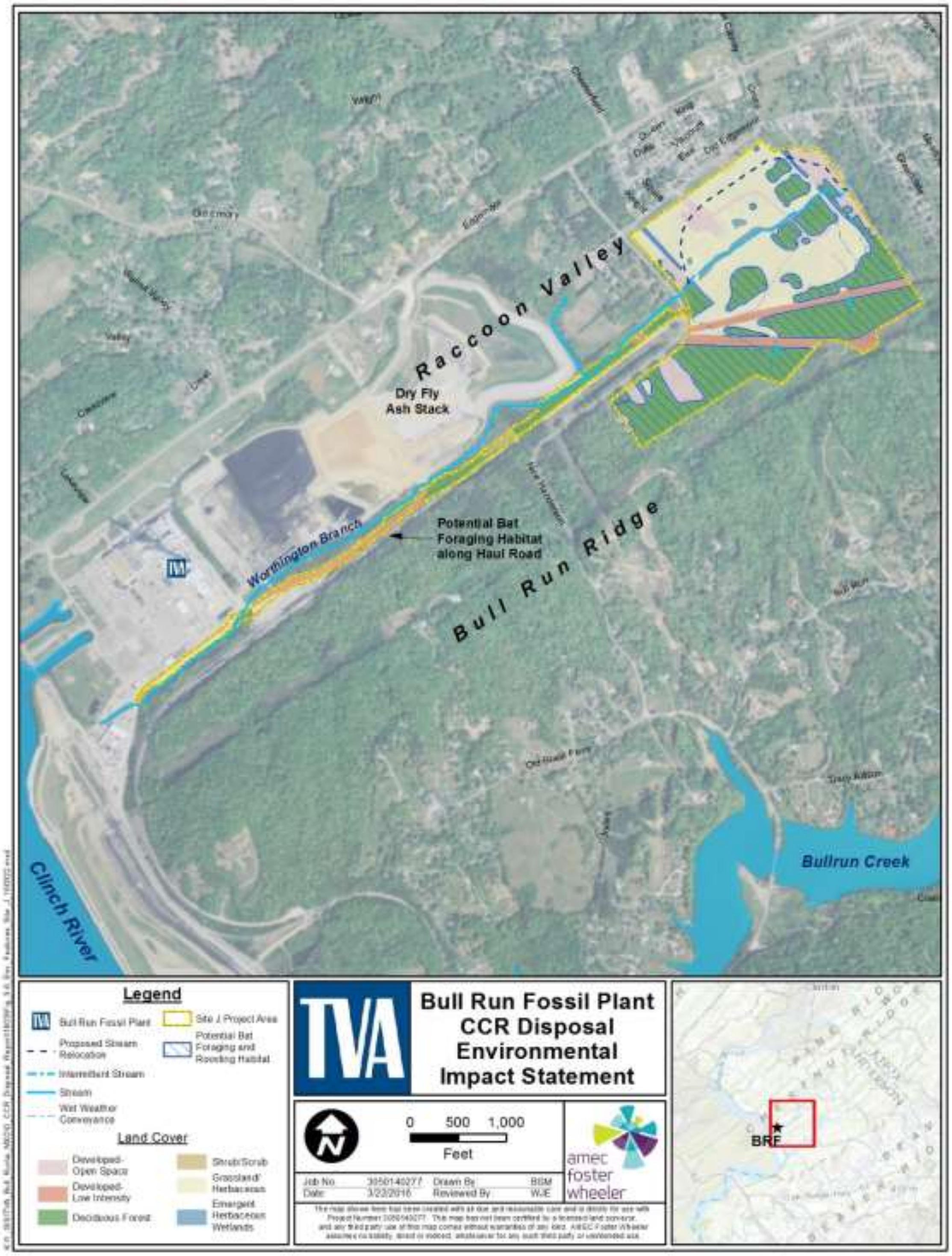


**Figure 3-6. Land Cover and Wildlife Habitat Within Site J**

#### 3.9.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Permanent impacts to 119.9 ac of vegetation would result from the construction of the landfill, and an additional 14.8 ac would be impacted by the haul road (see Table 2-3).

Construction of the landfill would primarily impact the deciduous forest and grassland/ herbaceous land cover areas. Additionally, some areas of open space and low intensity developed lands may be impacted. Because many of the potentially affected plant communities are somewhat disturbed, consisting of young trees, invasive shrubs and early successional herbaceous pastures, potential direct impacts are minor relative to the abundance of similar cover types within the vicinity.

Although transportation of construction material has the potential to introduce invasive plants, BMPs consisting of erosion control measures and use of approved, non-invasive seed mixes designed to establish desirable vegetation would mitigate that risk. Potential indirect impacts of the transport of borrow material are associated with the deposition of fugitive dust on adjacent vegetation. However, this potential impact would be minimized as the haul road is contained within the boundaries of the existing plant and the use of BMPs that include covering loads during transport. Therefore, impacts to vegetation under this alternative would be minor.

#### 3.9.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge Landfill)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to land cover types that have not already been considered in the issuance of the existing landfill permit.

Potential indirect impacts to vegetation relate to the transport of CCR material to the receiving landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Therefore, any resources along the haul route are already subjected to vehicular traffic destined for the landfill, and no new roads would need to be constructed. Trucks hauling CCR materials along this route would potentially result in minor increases of fugitive dust and exhaust emissions that could indirectly impact vegetation resources along the route due to deposition. However, BMPs such as covered loads and equipment maintenance would be implemented as appropriate to minimize impacts. Therefore, no notable indirect impacts to vegetation are expected to occur from the transport of CCR material to Chestnut Ridge.

## 3.10 Wildlife

### 3.10.1 Affected Environment

The area evaluated for wildlife impacts includes the proposed Site J, the haul road between the proposed landfill site and BRF and their immediate surroundings. Habitats within these areas include roads, maintained grassed berms with fir trees and riparian zones, mature forested areas, wetlands and open grassy fields in the previously disturbed areas.

Migratory birds are protected under the Migratory Bird Treaty Act of 1918. Habitats within the project area could provide suitable roosting and foraging habitat for a range of migratory birds. Birding hot spots for migratory song birds are known from several locations less than 2 mi from the project area, across Melton Hill Lake. Multiple species of migratory song birds, including brown thrasher, mourning dove, Carolina wren, American robin and pine warbler were observed in the Site J project area in October 2015.

Birds commonly observed in woodland and/or early successional habitat interspersed with human infrastructure and dwellings include Carolina wren, tufted titmouse, northern mockingbird, northern cardinal, eastern towhee, eastern bluebird, brown thrasher, field sparrow and eastern meadowlark. Red-tailed hawk and American kestrel also forage along road right of ways (Sibley 2000; LeGrand 2005). Mammals routinely observed in this type of landscape include bat, Virginia opossum, raccoon, eastern cottontail, striped skunk, white-tailed deer, eastern mole, woodchuck and rodents such as white footed mouse and hispid cotton rat (Whitaker and Hamilton 1998). Amphibian and reptile species that may be found in this habitat include black racer, ring-necked snake, gray rat snake, eastern garter snake, copperhead snake, spring peeper and upland chorus frog (LeGrand 2005; Conant and Collins 1998; Niemiller et al. 2013).

Notable wildlife records in the vicinity of BRF include one heron rookery (1.4 mi), two caves (3 mi) and an active osprey nest on a transmission line tower (0.5 mi) (TVA 2012). The small rookery was observed in 1996 and consisted of five pairs of great blue heron; however, no recent occurrences of this rookery have been recorded. Based on review of aerial photography and a cursory field visit, suitable habitat for heron colonies is not available within the project footprint. Due to the lack of recent occurrences and absence of roost sites within the project area, it is not expected that herons would be found on-site. In addition, no osprey nests or caves were observed on the site during the October 2015 site visit.

### 3.10.2 Environmental Consequences

#### 3.10.2.1 Alternative A – No Action

Under this alternative, no construction would occur. Therefore, resident wildlife found in the project area would continue to opportunistically use available habitats within the project area. No tree clearing would occur in conjunction with this alternative. As a result, no impacts would occur to migratory bird or mammal species. No direct or indirect impacts to wildlife would occur with this alternative.

#### 3.10.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Alternative B would result in the conversion of 56.0 ac of forested habitat, 46.6 ac of grassland/old field habitat and lesser amounts of other land types (primarily disturbed/ developed). During construction, most mobile wildlife present within the project site would likely disperse to adjacent and/or similar habitat, whereas direct mortality may result to less mobile species.

The project is not expected to result in a significant change to available suitable habitat for any species common to the area. Proposed actions are not expected to significantly impact the local population of any wildlife species. Although approximately 56 ac of forested areas within the project area would be removed, adjacent areas provide abundant forested areas that would accommodate displaced biota. Additionally, in consideration of the large distance to documented heron rookeries or established osprey nesting sites, no impacts to these species are expected.

Following the construction phase, wildlife use of the proposed landfill would be limited; however, the herbaceous areas of the vegetated cover could be used by grassland dependent species. While the proposed project would result in alteration of habitats and displacement of resident wildlife species, these effects are not expected to result in notable alteration or destabilization of any species.

In consideration of the highly disturbed habitats present within and along the proposed haul road and the availability of higher quality wildlife habitat in proximity to both the proposed haul road and Site J, potential direct and indirect impacts to associated wildlife are expected to be minor.

#### 3.10.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because the Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to land cover types and their associated wildlife populations that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to wildlife are expected to occur with this alternative.

## 3.11 Aquatic Ecology

### 3.11.1 Affected Environment

BRF is located in the impounded portions of the Clinch River, on Melton Hill Lake, near CRM 48.0. The Melton Hill Dam impounds the 5,470-ac Melton Hill Reservoir and is the only TVA tributary dam serviced by a navigation lock.

BRF is located in Raccoon Valley, where Worthington Branch is the primary drainage feature for the valley and the project area (see Figure 3-5). Worthington Branch is a freshwater perennial stream in its lower reaches near BRF, but is intermittent upstream of New Henderson Road (observed to be dry in October 2015). The stream enters the project area from a culvert under Isabella Lane and flows southeast through Site J, passing through a culvert under a gravel site access road. From Site J, the stream continues southwest through culverts under New Henderson Road into a forested area between the existing dry fly ash stack and a rail line. The stream flows southwest along the rail line and through a box culvert under an access road continuing outside the project area toward its confluence with the Clinch River, approximately 1.8 mi west of Isabella Lane.

In addition, there are two minor drainages, approximately 103.5 and 160 ft in length located on the southeast and southwest edges of Site J that flow into Worthington Branch. Both of these drainages have a groundwater connection and were observed to support macroinvertebrate populations.

Site J also contained two former impoundments (farm ponds) located just to the north of Worthington Branch in the central portion of Site J. However, these impoundments have been removed and are connected to Worthington Branch by ditches excavated to promote drainage from the former impoundments. The former impoundments are discussed further in Section 3.13 (Wetlands).

In the eastern portion of the project area and upstream of New Henderson Road, Worthington Branch is a shallow, linear intermittent stream that has poorly to moderately vegetated banks and a substrate dominated by sand, clay, gravel and silt. As the stream flows west, the stream gains sinuosity, the substrate transitions to bedrock, cobble and gravel with some coarse sand, and the stream banks become more stable. Channel shading transitions from less than 10 percent in the open pastures in Site J to over 80 percent in the forested portions of the western project area. Flow and water permanence increase with input from an unnamed perennial tributary near the eastern point of the dry fly ash stack. Downstream of the confluence, Worthington Branch's channel width increases from 5 ft to 10 ft and then again to 15 ft and flow transitions from weak-moderate to moderate-strong.

The shoreline and substrate of Worthington Branch were evaluated for aquatic habitat in October 2015. Worthington Branch downstream of New Henderson Road has riffles, runs, glides and pools combining for four flow regime types: (1) slow-shallow, (2) fast-shallow, (3) slow-deep and (4) fast-deep. Additional habitat observed in the stream included detritus, leaf packs, root mats, undercut banks and woody debris. Aquatic vegetation within the channel was limited.

No formal surveys for macroinvertebrates, mussels or fish have been conducted for Worthington Branch within the project area. However, TVA has conducted surveys on the Clinch River and in Bullrun Creek near the project area, which represent the best available data. While some species characteristic of the Clinch River may be found within lower reaches of Worthington Branch (especially during high flow conditions), the aquatic biota of the more permanently flowing portions of Worthington Branch are more likely to be more simple communities characteristic of low flow tributary streams.

TVA surveyed the benthic community at three sites on the Clinch River in 2014, including CRM 47.0 near the confluence of Worthington Branch. Multiple samples at this location had an average of 14.5 taxa, while the average number of Ephemeroptera, Plecoptera and Trichoptera taxa present was only 0.7; the average proportion of oligochaetes present in the samples was 48.7 percent (TVA 2015a). In 2010, TVA conducted a mussel and habitat survey to characterize mussel resources in the Clinch River adjacent to BRF.

The mussel fauna in the Clinch River near BRF has been altered substantially by the impoundment of Melton Hill Reservoir. Only four mussel specimens were collected along the BRF waterfront, comprised of three common species, the mapleleaf, fragile papershell and three-horn wartyback (Third Rock Consultants 2010). However, because of the intermittent nature of Worthington Branch within much of the project area, bivalve mussel species are likely to be absent from the immediate project area.

A benthic macroinvertebrate or mussel survey was not conducted during the October 2015 site visit. However, species observed included dragonfly and damselfly larvae, caddisfly larvae, beetles, mayfly larvae and pleurocerid freshwater snails. Some portions of Worthington Branch in the western project area exhibited a high density of pleurocerid snails. One shell of a mountain creekshell mussel, a common species in the region, was observed in the substrate.

TVA has evaluated the health of the fish community in the Clinch River using the Reservoir Fish Assemblage Index at CRM 45.0, downstream the confluence of Worthington Branch and at CRM 66 upstream of BRF as a part of the Vital Signs Monitoring Program since 2001 (TVA 2015a). In 2014, the fish community rated “Fair” at both of these locations, and has historically rated “Good” or “Fair” at these locations. During the 2014 study:

- Thirty-seven species were collected, including 17 commercially valuable species and 20 recreationally valuable species.
- Common centrarchid species present at BRF included black crappie, white crappie, bluegill, green sunfish, redear sunfish, and warmouth.

- Benthic invertivore species present included freshwater drum, black redhorse, golden redhorse, silver redhorse, logperch, northern hog sucker and spotted sucker.
- Top carnivore species present included black crappie, flathead catfish, largemouth bass, rock bass, skipjack herring, smallmouth bass, spotted bass, walleye, white crappie, white bass and yellow bass.
- Intolerant species present included black redhorse, brook silverside, northern hog sucker, rock bass, skipjack herring, smallmouth bass, and spotted sucker. In addition, three thermally sensitive species, white sucker, spotted sucker and logperch, were present (TVA 2015a).

Chestnut Ridge is an existing landfill located approximately 12 mi northeast of BRF. Since it is currently an active landfill, no aquatic resources are present.

### 3.11.2 Environmental Consequences

#### 3.11.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, no impacts to aquatic resources would occur. Accordingly, project-related environmental conditions for aquatic resources in the project area would not change under the No Action Alternative.

#### 3.11.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under Alternative B, the proposed project would include the construction of a landfill east of the BRF facility at Site J and the construction of a haul road between the BRF facility and the proposed Site J landfill. The construction of the landfill at Site J would require realigning approximately 2,158 linear ft of a section of Worthington Branch and its tributaries to provide a larger landfill waste disposal area. This section of the stream would be relocated to the north into an excavated channel, approximately 2,700 ft that would arc around the landfill footprint before flowing back into the natural channel near New Henderson Road.

The construction of a haul road from BRF to the landfill at Site J would include the construction of a private bridge to take hauling traffic over New Henderson Road. In addition, approximately 1,321 linear ft of Worthington Branch (combined) would be realigned to the north along the proposed haul road.

Direct impacts to aquatic habitat would be limited to stream realignments and culverting. Stream alteration activities would be done in compliance with applicable TDEC and USACE 404/401 permits obtained for the proposed actions, which would require mitigation, such as on-site stream restoration and contributing to a stream mitigation bank, per permit requirements.

The proposed stream realignment, a direct impact, represents a permanent impact to Worthington Branch. The impact would be offset and mitigated by reconstruction of the stream channel around Site J and implementation of mitigation requirements such as identified above. However, long-term impacts would be minor as the realigned stream channel sections develop natural flow regimes, substrates and subsequent habitats. Watershed level impacts would be insignificant given the local abundance of similar aquatic resources.

The direct impacts would be minor for mobile aquatic resources, such as fish, that would likely avoid sections of the stream during construction activities and quickly repopulate realigned stream sections shortly following construction completion. Less mobile and sessile aquatic resources (aquatic macroinvertebrates) would be directly impacted by fill placement during construction. However, many macroinvertebrate species would repopulate quickly through their mobile adult phase of life.

Indirect impacts to downstream reaches of Worthington Branch may be associated with storm water runoff due to temporary construction activities, or upstream construction activities within the stream. Construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources during the construction phase, such as in-stream sediment curtains or baffle barriers. Additionally, flow alteration in downstream sections of Worthington Branch would be caused by runoff from the landfill site. These impacts would be mitigated by the use of detention basins and other BMPs on-site. Following the construction phase, care and maintenance of the approved closure system and site-wide management of storm water using appropriate BMPs would minimize indirect impacts to the aquatic community of the receiving waters.

#### 3.11.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge is an existing permitted landfill, there would be no additional direct impacts to surface water resources and their associated aquatic biota that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to aquatic ecosystems are expected to occur with this alternative.

## 3.12 Threatened and Endangered Species

### 3.12.1 Affected Environment

The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the United States or elsewhere. The ESA outlines procedures for federal agencies to follow when taking actions that may affect federally listed species or their designated critical habitat.

The state of Tennessee provides protection for species considered threatened, endangered or deemed in need of management within the State other than those already federally listed under the ESA. Plant species are protected in Tennessee through the Rare Plant Protection and Conservation Act of 1985. The listing of species is managed by the TDEC.

Additionally, the Tennessee Natural Heritage Program and TVA both maintain databases of aquatic and terrestrial plant and animal species that are considered threatened, endangered, special concern, or are otherwise tracked in Tennessee because the species is rare and/or vulnerable within the state.

#### 3.12.1.1 Wildlife

According to the USFWS, there are 22 federally listed species within Anderson County (USFWS 2016). A review of the TVA Regional Natural Heritage database in November 2015 indicated that of those species listed by USFWS, 11 species are currently known or have been known to occur within a 5-mi radius of the project area (Table 3-5). Additionally, 13 state-listed species have occurrence records within a 5-mi radius of BRF. The Indiana bat (*Myotis sodalis*), gray bat (*Myotis grisescens*) and northern long-eared bat (*Myotis* *septentrionalis*) are also evaluated herein because these federally listed bat species are known to occur throughout the region, including Anderson County.

Within Anderson County, 17 state or federally listed freshwater mussel species and one aquatic snail are listed as threatened or endangered. Nine of the mussel species and the aquatic snail are also recorded within a 5-mi radius of BRF. All of these aquatic species require freshwater systems with flowing water (Biggens 1991; Ahlstedt 1983; Ahlstedt 1984a; Ahlstedt 1984b; Neves 1984; Dillon et al. 2013). Worthington Branch is a small, perennial stream (in its lower reaches) that flows through Site J and is a tributary to the Clinch River (see Section 3.7 Surface Water for more detail). Threatened or endangered mussel species are not expected to occur in Worthington Branch as it does not provide the large riverine habitat required by these species. As such, these species of mollusks listed in Table 3-5 are not discussed further in relation to Worthington Branch. A recent mussel survey of the riverfront at BRF did not reveal the presence of any state-listed or federally-listed threatened or endangered mussel species (Third Rock Consultants, LLC 2010).

Spotfin chub is listed as threatened with a rank of S2 (very rare and imperiled) and federally listed as threatened. Its habitat consists of large upland creeks or medium rivers with moderate to swift currents over gravel or bedrock. Spotfin chub is known to occur in Anderson County but has not been identified within 5-mi of the project area. Worthington Branch is intermittent upstream of New Henderson Road and therefore, does not support this species within Site J. Downstream of Henderson Road Worthington Branch does not provide swift currents over un-silted substrate. Therefore spotfin chub is not expected to occur within Worthington Branch.

The Tennessee dace is a state-listed in need of management (NMGT) fish species with a rank of S3 (vulnerable). The Tennessee dace is only found in spring fed, first order streams with gravel, sand and silt-bottomed pools. The TVA Regional Natural Heritage Database records of the Tennessee dace within 5-mi of the project area include the Clinch River watershed. Since the Worthington Branch is not a spring-fed, first order stream, the Tennessee dace is not expected to occur on-site.

The hellbender is state-listed NMGT with a rank of S3 (vulnerable). A single hellbender was caught in a gill net in Melton Hill Reservoir in 1976 but more recent occurrences of this species in the vicinity of the plant are unknown. Hellbenders are completely aquatic salamanders and prefer fast-flowing, clear, well-oxygenated streams and rivers with substrate consisting of large flat boulders and logs. In Virginia, hellbenders have been observed in streams as small as 165 ft and rivers over 300 ft wide (Virginia Department of Game and Inland Fisheries 2015). Worthington Branch does not provide suitable habitat for the hellbender. Therefore, this species is not likely to be found within the project area.

The barn owl is state-listed NMGT with a rank of S3 (vulnerable). A nesting pair was observed in Knox County (Tennessee) within 2-mi of BRF in 1987, but more occurrences of this species in the vicinity of the plant are unknown. Open habitats such as grasslands, deserts, marshes and agricultural fields are preferred, but the use of suitable foraging habitat can be limited by a lack of proximity to nesting and roosting sites. In Tennessee, these birds are known to nest every month of the year except in August (Nicholson 1997). Hollow trees, cavities in cliffs and riverbanks, nest boxes and many human structures (barns) are readily used for nesting and roosting (Marti et al. 2005). The forested habitat at the southern boundary of the project area may include suitable roosting habitat for barn owls.

**Table 3-5. Species of Conservation Concern within Anderson County and the Vicinity of Site J at BRF[1]**

| | Common Name | Scientific Name | Status Federal[2] | Status State[3] (Rank[4]) |
|---|---|---|---|---|
| **Mollusks** | Alabama lampshell | *Lampsilis virescens* | LE | END (S1) |
| | Anthony's riversnail | *Athearnia anthonyi* | LE | END (S1) |
| | Cracking pearlymussel* | *Hemistena lata* | LE | END (S1) |
| | Cumberland bean | *Villosa trabalis* | LE | END (S1) |
| | Cumberland elktoe | *Alasmidonta atropur* | LE | END (S1s2) |
| | Dromedary pearlymussel* | *Dromus dromas* | LE | END (S1) |
| | Fanshell | *Cyprogenia stegaria* | LE | END (S1) |
| | Fine-rayed pigtoe* | *Fusconia cuneolus* | LE | END (S1) |
| | Orange-foot pimpleback* | *Plethobasus cooperianus* | LE | END (S1) |
| | Pink mucket* | *Lampsilis abrupta* | LE | END (S2) |
| | Ring pink | *Obovaria retusa* | LE | END (S1) |
| | Rough pigtoe | *Pleuroblema plenum* | LE | END (S1) |
| | Rough rabbitsfoot | *Quadrula cylindrica strigillata* | LE | END (S2) |
| | Sheepnose mussel | *Plethobasus cyphyus* | LE | TRKD (S2S3) |
| | Shiny pigtoe pearlymussel* | *Fusconaia cor* | LE | END (S1) |
| | Spectaclecase* | *Cumberlandia monodonta* | LE | TRKD (S2S3) |
| | Spiny riversnail* | *Io fluvialis* | -- | TRKD (S2) |
| | Tennessee clubshell* | *Pleurobema oviforme* | -- | TRKD (S2S3)) |
| | White wartyback* | *Plethobasus cicatricosus* | LE | END (S1) |
| **Fish** | Spotfin chub | *Erimonax monachus* | LT | THR (S2) |
| | Tennessee dace* | *Chrosomus tennesseensis* | -- | NMGT (S3) |
| **Amphibians** | Hellbender* | *Cryptobranchus alleganiensis* | PS | NMGT (S3) |
| **Birds** | Barn Owl* | *Tyto alba* | -- | NMGT (S3) |
| **Mammals** | Gray bat[5] | *Myotis grisescens* | LE | END (S2) |
| | Indiana bat[5] | *Myotis sodalis* | LE | END (S1) |
| | Northern long-eared bat[5] | *Myotis septentrionalis* | LT | (S1S2) |
| **Plants** | American ginseng* | *Panax quinquefolius* | -- | S-CE (S3S4) |
| | Branching whitlow-wort* | *Draba ramosissima* | -- | SPCO (S2) |
| | Earleaf foxglove* | *Agalinis auriculata* | -- | END (S2) |
| | Hairy false gromwell* | *Onosmodium hispidissimum* | -- | END (S1) |
| | Heller's catfoot* | *Pseudognaphalium helleri* | -- | SPCO (S2) |
| | Naked-stem Sunflower* | *Helianthus occidentalis* | -- | SPCO (S2) |
| | Mountain honeysuckle* | *Lonicera dioica* | -- | SPCO (S2) |
| | Northern white cedar* | *Thuja occidentalis* | -- | SPCO (S3) |
| | Ozark bunchflower* | *Melanthium woodii* | -- | END (S1) |
| | Prairie goldenrod* | *Solidago ptarmicoides* | -- | END (S1S2) |
| | Shining ladies'-tresses* | *Spiranthes lucida* | -- | THR (S1S2) |
| | Slender blazing-star* | *Liatris cylindracea* | -- | THR (S2) |
| | Spreading false-foxglove* | *Aureolaria patula* | -- | SPCO (S3) |
| | Tall larkspur* | *Delphinium exaltatum* | -- | END (S2) |
| | Western false gromwell* | *Onosmodium molle* ssp. *occidentale* | -- | THR (S2) |

[1] Source: USFWS 2016 and TVA Regional Natural Heritage database, accessed November 2015

[2] Federal Status Codes:
DM = Delisted, recovered and being monitored; LE = Listed endangered
LT = Listed threatened; PE = Proposed endangered
CAND = Candidate for federal listing; PS = partial status (subspecies listed in Midwest)

[3] State Status Codes:
END = Listed endangered; NMGT = Listed in need of management
S-CE = Special concern, commercially exploited; SPCO = Species of special concern
THR = Listed threatened; TRKD = Tracked as sensitive but has no legal status

[4] State Rank:
S1 = Extremely rare and critically imperiled; S2 = Very rare and imperiled
S3 = Vulnerable; S4 = Apparently secure, but with cause for long-term concern
SH = Historic in TN; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

[5] Known throughout the region but no occurrence records within 2-mi of the project site. Indiana bat and northern long-eared bat were documented at 6.42 mi.

* Species documented within 5 mi of Site J at BRF.

The gray bat is listed as federally endangered by the USFWS (USFWS 2007). Gray bat roosts in caves throughout the year and forages over water including streams and reservoirs where they consume night flying aquatic insects near the water surface. Unlike other bat species, gray bats are restricted year-round to only cave and cave-like habitats for both hibernation and roosting. There are 13 caves located within 5 mi of the project area. However, the closet record of cave use by gray bats is greater than 3 mi away. The record does not indicate if this cave is a winter hibernacula or summer maternity roost for gray bat. The closest foraging habitat is located along Melton Hill Reservoir, more than 1.5 mi away. Suitable roosting and foraging habitats are not available within the project area.

The Indiana bat is listed as federally endangered by the USFWS (USFWS 2007). The species overwinters in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour and Davis 1974). Indiana bats disperse from wintering caves to areas throughout the eastern U.S. This species range extends from New York and New Hampshire in the north to Alabama, Georgia and Mississippi in the south and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable summer roosting habitat. Use of living trees with suitable roost characteristics in close proximity to suitable snags has also been documented. The availability of trees of a sufficient bark condition, size and sun exposure is another important limiting factor in how large a population an area can sustain (Tuttle and Kennedy 2002; Harvey 2002; Kurta et al. 2002). Thirteen cave sites are known to occur offsite within 5-mi of Site J at BRF. A search of the TVA Regional Natural Heritage database in November 2015 indicated that an Indiana bat was recorded in a summer mist net event on the Oak Ridge Reservation 6.42 mi from BRF.

The northern long-eared bat is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending into eastern Montana and Wyoming and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and with high humidity and minimal air currents. During summer this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter ≥3 in). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats forage in upland and lowland woodlots, tree-lined corridors and water surfaces, feeding on insects. In general, habitat use by northern long-eared bats is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2014). A search of the TVA Regional Natural Heritage database in November 2015 indicated that a northern long-eared bat was recorded in a summer mist net capture 6.42 mi from the proposed project on the Oak Ridge Reservation.

A survey was conducted in October 2015 to determine bat habitat suitability along the proposed haul road and within the proposed landfill site. No caves were observed within the project site. However, the 10-ft box culvert on Worthington Branch under an existing gravel road could provide suitable roosting habitat for the northern long-eared bat (Keeley and Tuttle 1999). Although the 7.5 ac of forested area along the haul road may provide foraging habitat, it is of poor quality due to the dense understory. Suitable bat roosting habitat was not observed along the haul road. Forested areas within proposed landfill site (48.5 ac) were determined to provide suitable foraging and roosting habitat (see Figure 3-6).

### 3.12.2 Plants

A review of the TVA Regional Natural Heritage database indicated that no federally listed plant species are known to occur within 5 mi of the proposed project site (TVA 2015). Fifteen state-listed plant species are known to occur in the vicinity of BRF (Table 3-6). Habitat requirements for each of these species are presented in Table 3-6. Based on the preferred habitat, none of the listed plants are known to exist in the Site J project area at BRF.

### 3.12.3 Environmental Consequences

#### 3.12.3.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, no impacts to threatened or endangered species would occur.

#### 3.12.3.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

The area of impact subject to project activities under this alternative is primarily comprised of developed or disturbed land that is generally unsuitable for the species listed in Table 3-5. As discussed in Subsection 3.11.1, Worthington Branch is a small freshwater stream (perennial downstream of Henderson Road, but intermittent above Henderson Road) that provides suitable habitat for some aquatic species. However no threatened or endangered aquatic animal species have been recorded. Intermittent reaches of Worthington Branch will be permanently impacted by landfill construction while downstream reaches would be temporarily impacted during construction. However, aquatic communities within the realigned intermittent section of Worthington Branch upstream of Henderson Road would be expected to recolonize as the stream again forms new riffle/run/pool habitats following construction. All work will be done under the conditions of state and federal permits using BMPs to avoid and minimize impacts during construction. No aquatic animal species listed as threatened or endangered are known or have been observed within the project area. Therefore, no impacts to threatened and endangered aquatic animal species as a result of the proposed action are anticipated.

The majority of the terrestrial habitat on-site has been severely degraded and is populated with weedy and adventive species. Therefore, it is generally unsuitable habitat for the listed plant species identified within the vicinity of BRF (see Table 3-6). The forested habitat at the southern end of the project area consists of a mosaic of mixed evergreen-deciduous forests and is not known to support any plant species listed as threatened or endangered (Section 3.9, Vegetation).  Therefore, impacts to threatened or endangered plants are not anticipated.

Suitable habitat for hellbender is absent within the project area. Therefore, hellbender would not be impacted by the proposed actions. Barn owl nesting and foraging habitat is present within the project area for this alternative. Since records show this species as previously nesting within 2-mi of BRF, the proposed actions may directly impact individuals of this species should nesting occur within the project area. However, significant impacts to populations of this species are not anticipated as similar nesting and foraging habitat is present in the surrounding landscape.

**Table 3-6. Habitat Requirements for Plant Species of Conservation Concern within the Vicinity of Site J at BRF**

| Common Name | Habitat Requirements | Habitat within Project Area |
|---|---|---|
| American ginseng | Humus-rich woodland soil and prefers shaded, north-facing hillsides[1] | No |
| Branching whitlow-wort | Calcareous bluffs, shale barrens and rocky wooded areas[2] | No |
| Earleaf foxglove | Barrens, prairies glades and fallow fields[3] | No |
| Hairy false gromwell | Forested habitat in calcareous areas[3] | No |
| Heller's catfoot | Glades or woodland openings in sandy or mafic soils[3] | No |
| Naked-stem Sunflower | Limestone glades and barrens[4] | No |
| Mountain honeysuckle | Mountain woods and thickets, the edges of bluffs and the banks of waterways[4] | No |
| Northern white cedar | Calcareous rocky seeps and along cliffs where it is often associated with wetlands[5] | No |
| Ozark bunchflower | Rich wooded slopes in high quality deciduous woodlands[4] | No |
| Prairie goldenrod | Barrens[2] | No |
| Shining ladies'-tresses | Alluvial woods and along moist slopes[4] | No |
| Slender blazing-star | Barrens in high quality prairie areas[4] | No |
| Spreading false-foxglove | Requires canopy openings in mixed hardwood forests on limestone slopes associated with large streams and rivers[6] | No |
| Tall larkspur | Dry, exposed cedar barrens and prairie/forest edge in eastern Tennessee at the Oak Ridge Reservation[7] | No |
| Western false gromwell | Glades[4] | No |

[1] North American Native Plant Society 2015
[2] Flora of North America 2010
[3] NatureServe 2015
[4] TDEC 2014
[5] NRCS 2015
[6] Kentucky State Nature Preserves Commission 2015
[7] Salk and Parr 2006

Thirteen cave sites which have the potential to provide roosting habitat for gray bat, Indiana bat and northern long-eared bat are known to be located within 5-mi of the Site J Project Area. However, there would be no impacts to these caves as a result of the proposed action. Up to 48.5 ac of potentially suitable summer roost trees for the Indiana bat and northern long-eared bat are present within the project area. However, this area constitutes less than 1 percent of the total forested area within a 5-mi radius of the project area. Avoidance and minimization efforts to reduce impacts to these species would be implemented as required through consultation with the appropriate state and federal agencies, including avoiding timber clearing during the summer roosting season (April 1 to September 30). Unavoidable impacts to these species would be mitigated as required in accordance with ESA during Section 7 consultation with USFWS. Therefore, impacts to threatened and endangered species are expected to be minor under this alternative.

Therefore, impacts to threatened and endangered species are expected to be minor under this alternative.

#### 3.12.3.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge is an existing permitted landfill, there would be no additional direct impacts to threatened or endangered species and their associated habitats that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to threatened or endangered species are expected to occur with this alternative.

## 3.13 Wetlands

### 3.13.1 Affected Environment

The USACE regulates the discharge of fill material into waters of the United States, including wetlands pursuant to Section 404 of the CWA (33 United States Code [USC] 1344). Additionally, EO 11990 (Protection of Wetlands) requires federal agencies to avoid, to the extent possible, adverse impact to wetlands and to preserve and enhance their natural and beneficial values.

As defined in the Section 404 of the CWA, wetlands are those 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. Wetlands and wetland fringe areas can also be found along the edges of many watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits including flood storage, erosion control, water quality improvement, wildlife habitat and recreation opportunities.

BRF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion where the land use and land cover includes mostly mixed forest with some prairie and cropland on less sloping land (Griffith et al. 2001). Natural vegetation includes Appalachian oak forest and some mixed mesophytic forest consisting of upland species.

Wetlands identified on National Wetland Inventory maps within the project area include 0.2 ac of PUBHh wetland (freshwater impoundment). This mapped area is located at one of the two small man-made impoundments described in further detail in Section 3.7 (Surface Water). Field delineation efforts to describe the present state of these impoundments are discussed below. Land use/land cover data shows that wetlands comprise approximately 1.5 percent (2.1 ac) of the land use within the project area (134.7 ac) and 1.5 percent (775.4 ac) of the surrounding 5-mi radius (50,264.9 ac) (see Table 3-1).

Wetlands were delineated within the project area in November 2011 as part of a previous TVA project (TVA 2013). A second field survey was performed in October 2015 for the proposed haul road, during which the area within Site J was re-assessed. Potential jurisdictional Waters of the United States (WOUS) were evaluated in accordance with the Regional Supplement to the USACE Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0). Within the Site J project area, a small 1.8-ac emergent wetland was identified along the floodplain of Worthington Branch. This wetland begins as fringe along the stream bank and continues up the slope for a short distance. Dominant hydrophytic vegetation in the wetland includes black willow and sycamore shrub/saplings, cattail, common rush and jewelweed in the herbaceous layer. The TVA Rapid Assessment Method was used to assess wetland condition and identify wetlands with potential ecological significance (Mack 2001). Using the TVA Rapid Assessment Method, the wetland was classified as a Category 2 wetland (moderate quality and exhibits reasonable potential for restoration).

Based on the most recent site visit, it was determined that both of the impoundments within Site J currently have man-made ditches that drain the ponds into Worthington Branch. Based on the topography of the area and historical ponding, the significant nexus to the stream and vegetation observed (predominantly cattail), these two former impoundments would also be considered WOUS with a total area of 0.3 ac. There were no wetlands identified along the proposed haul road. Therefore, the total area of jurisdictional WOUS within Site J is 2.1 ac.

Chestnut Ridge Landfill is an existing landfill located approximately 12 mi northeast of BRF. Since it is currently an active landfill, natural resources within the site are minor to non-existent. CCR material from BRF to Chestnut Ridge would be transported along existing transportation corridors.

### 3.13.2 Environmental Consequences

#### 3.13.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, there would be no impacts to wetland resources.

#### 3.13.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Construction, operation and maintenance of the proposed landfill would result in direct loss of 2.1 ac of emergent wetlands. However, effects of wetland impacts at Site J would be minor when viewed in the context of the 775.4 ac of wetland resources within the surrounding 5-mi region, as this impact corresponds to approximately 0.3 percent of wetlands within this region. Potential indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff during construction into off-site or nearby wetlands, but BMPs would be implemented to minimize this potential. Unavoidable direct impacts to wetlands would be mitigated as required by both state and federal agencies in accordance with the Tennessee Water Quality Control Act and Section 404 of the CWA. Therefore, development of the proposed landfill would be consistent with EO 11990.

#### 3.13.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to wetland resources and their associated biota that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to wetland ecosystems are expected to occur with this alternative.

## 3.14 Solid/Hazardous Waste

### 3.14.1 Affected Environment

#### 3.14.1.1 Solid Waste

In Tennessee, requirements for management of solid wastes are focused on solid waste processing and disposal under Rule 0400-11-.01. Solid wastes are defined in the rule as garbage, trash, refuse, abandoned material, spent material, byproducts, scrap, ash, sludge and all discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial and agricultural operations, and from community activities. Currently, the solid waste generated at BRF is managed in accordance with federal and State requirements. The solid waste generated from the proposed activities would be from construction, operation and/or maintenance activities.

Under TDEC Rule 0400-11-.01-.01, special wastes include sludges, bulky wastes, pesticide wastes, industrial wastes, combustion wastes, friable asbestos and certain hazardous wastes exempted from RCRA Subtitle C requirements.

On April 17, 2015, the Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule) was published in the Federal Register. Under the final rule, CCR wastes are not regulated as hazardous wastes.

When generating at full capacity, BRF consumes approximately 7,300 tons of coal per day. The primary solid wastes that result from the operation of BRF are collectively known as CCR. The primary CCR waste streams are fly ash, bottom ash and gypsum. Currently, all CCRs generated at BRF are handled and disposed of on a dry basis.

The in-place quantities of CCR that are estimated to be generated at BRF daily and annually are provided below in Table 3-7.

**Table 3-7. Summary of Waste Disposal Volumes at BRF**

| Waste Materials | Tons/Year | Tons/Day | $Yd^3$/Year | $Yd^3$/Day |
|---|---|---|---|---|
| Bottom and Fly Ash | 240,000 | 660 | 179,700 | 542 |
| FGD Gypsum | 318,000 | 870 | 346,500 | 950 |
| Total | 558,000 | 1,530 | 554,200 | 1,492 |

Source: TVA 2015e

Fly ash and boiler slag are comprised of the noncombustible particles or components in coal. Both fly ash and bottom ash are composed primarily of silica, aluminum oxide and iron oxide. These waste streams also contain a variety of heavy metals at limited concentrations including arsenic, cadmium, chromium, copper, lead, mercury and selenium. Under Rule 0400-11-.01-.01, CCR are regulated as special wastes that require special waste approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes (Class I or II disposal facility).

Forty-six structures including 20 houses were previously demolished on Site J (TVA 2013). Prior to conducting demolition, the structures were surveyed for the presence of asbestos containing material and lead-based paint. Structures containing these materials were properly abated prior to demolition. Creosote and pressure treated lumber associated with the structures was removed and managed as special wastes. Septic tanks were removed from the residences, and basements were backfilled with borrow material. Driveways, carports and foundations were demolished and the concrete and asphalt were disposed of off-site or used as fill material. Therefore, only a very limited volume of solid wastes or demolition debris remains at the site in conjunction with these former residences.

#### 3.14.1.2 Hazardous Waste

Hazardous materials are regulated under a variety of federal laws including OSHA standards, Emergency Planning and Community Right to Know Act (EPCRA), the RCRA, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and Toxic Substances Control Act.

Regulations implementing the requirements of EPCRA are codified in 40 CFR 355, 40 CFR 370 and 40 CFR 372. Under 40 CFR 355, facilities that have any extremely hazardous substances present in quantities above the threshold planning quantity are required to provide reporting information to the State Emergency Response Commission, Local Emergency Planning Committee and local fire department. Inventory reporting to the indicated emergency response parties is required under 40 CFR 370 for facilities with greater than the threshold planning quantity of any extremely hazardous substances or greater than 10,000 pounds of any OSHA regulated hazardous material. EPCRA also requires inventory reporting for all releases and discharges of certain toxic chemicals under 40 CFR 372. TVA applies these requirements as a matter of policy.

The federal law regulating hazardous wastes is RCRA and its implementing regulations codified in Title 40 CFR Parts 260-280. The regulations define what constitutes a hazardous waste and establishes a “cradle to grave” system for management and disposal of hazardous wastes.

Subtitle C of RCRA also includes separate, less stringent regulations for certain potential hazardous wastes. Used oil, for example, is regulated as hazardous waste if it is disposed of, but is separately regulated if it is recycled. Specific requirements are provided under RCRA for generators, transporters, processors and burners of used oil that are recycled. Universal wastes are a subset of hazardous wastes that are widely generated. Universal wastes include batteries, lamps and high intensity lights and mercury thermostats. Universal wastes may be managed in accordance with the RCRA requirements for hazardous wastes or by special, less stringent provisions.

BRF is considered a small quantity generator of hazardous waste by TDEC. The primary hazardous wastes currently generated include small quantities of waste paint, waste paint solvents, paper insulated lead cable, mercury contaminated debris, debris from sandblasting and scraping, paint chips, solvent rags due to cleaning electric generating equipment, Coulomat (used as moisture removal from oil) and liquid-filled fuses.

### 3.14.2 Environmental Consequences

#### 3.14.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not seek additional disposal options to manage CCR generated at BRF. TVA would continue to manage CCR in its existing dry fly ash stack for as long as capacity is available and there would be no impact associated with current landfill operations. In the long term, however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF and therefore theoretically, the amount of solid wastes produced at BRF would decrease. However, because any impact to operations at

BRF would not be consistent with TVA's long range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

### 3.14.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

#### 3.14.2.2.1 Construction

The primary potential issues concerning solid waste and hazardous wastes with respect to the proposed action are: (1) the potential for increased generation during construction; (2) the potential for increased generation from operation of the proposed action; and (3) the potential for a spill or release during operations or transportation.

Construction of the facility would require site preparation involving (1) vegetation removal over the 134.7-ac site; (2) excavation, re-compaction and grading over the 60-ac landfill footprint; (3) grading over much of the remaining acres of planned use area; and (4) construction of the haul road. The primary wastes resulting from these activities are:

- Soils from land clearing, grading and excavation.
- Landscaping/vegetative waste from grubbing, vegetation removal and grading operations.

The estimated depth to the top of rock over much of the site is approximately 5 ft. The proposed bottom liner system for the landfill consists of a 5-ft thick re-compacted geologic buffer, 2-ft of compacted clay overlain by a 60 milliliter (i.e., 0.060 inch) thick high density polyethylene flexible membrane liner. Construction of the recompacted geologic buffer component of the bottom liner system would require a minimum of 475,940 $yd^3$ of soil which would be derived from the landfill footprint itself. Construction of the 2-ft thick compacted clay layer would require 190,370 $yd^3$ of soil which would have to be derived from excavation on other portions of the site.

The proposed design includes a 1-ft thick interim cover for placement during operations and placement of a 2-ft thick final cover upon closure of the cells. Areas that have not reached final fill grades and would not receive CCR for 180 days would receive an interim cover to reduce infiltration and maintain a working area of approximately 10 ac. The periodic placement of an interim cover would prevent erosion and help maintain the integrity of the side slopes. A 30-day supply of cover material would be maintained to cover the working face on-site in the soil borrow/stockpile areas (Table 3-8).

**Table 3-8. Summary of Cover Material Quantities**

| Cover Material | Thickness (inches) | Quantity ($yd^3$) |
|---|---|---|
| Interim/Intermediate Cover (Compacted Soil)* | 12 | 95,100 |
| Final Cover – Protected Cover Soil | 12 | 95,100 |
| Final Cover – Vegetative Cover Soil | 12 | 95,100 |

* Intermediate cover may not be required in areas where final cover would be constructed within 180 days of final placement of CCR.

Source: TVA 2015e

Excess soil material excavated during construction of the landfill would be stockpiled in the designated borrow/stockpile area located within the Project Areas for Site J (see Figure 2-3). Preliminary soil balance estimates completed in support of the permit application (TVA 2015e), indicated that sufficient material would be available from on-site sources. However, where on-site soil is insufficient in terms of quality or quantity, TVA may supplement on-site soil with offsite borrow materials. The location of an off-site permitted borrow area has not been identified at this time, but all borrow soil would meet permit requirements. If excavated soil is required to be disposed of at a landfill, special waste approval for disposal of the soil may be required.

Landscaping wastes would also result from grubbing and land clearing operations necessary to construct the landfill and support areas. Much of Site J is open field or wooded. Slopes along the ridges toward Edgemoor Road and to the south of New Henderson Road are moderately to heavily wooded. The areas of higher elevation along the ridge south of New Henderson Road are not likely to be cleared unless that area is disturbed to obtain borrow soils. Moderate to heavily wooded mature stands would produce approximately 2,000 $ft^3$ or 16 cords of wood per acre upon clearing. The volume of wood estimated to result from clearing the site's most usable areas is 160,000 $ft^3$ or 1,250 cords of wood. Most of this wood may be harvestable as sawmill grade, chip materials and mulch. A portion of the wood, mainly stumpage, is considered economically unusable due to difficulties or costs associated with grinding on certain terrain or in certain areas. Some portion of the wood may not be harvestable because of specific locations (wetlands), species, condition, or infestation. It is estimated that 1 to 5 percent (48 to 240 tons) of wood in the area may not be harvestable and will become waste. These materials may be disposed offsite or onsite through open burning.  TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted.

The demolition debris associated with the former residences that remains in the project area and may be removed in conjunction with site preparation activities includes underground water piping (branch lines for service to the former houses and piping to barns and outbuildings), septic drain fields, underground conduits for electrical service to pole mounted lights and potentially natural gas branch lines. Masonry block associated with basements and construction rubble that may have been used to backfill basements would likely become solid wastes requiring off-site disposal during site development. The volume of demolition debris from the former structures generated during site development is estimated to be less than 300 $yd^3$. TVA will also manage and dispose of soils containing other water materials as appropriate, including septic drain fields and associated soils and soils containing residual pesticides in accordance with EPA and TDEC requirements.

In addition to these larger nonhazardous waste streams, limited quantities of nonhazardous solvents, paints and adhesives, spill absorbent, oil and solvent contaminated rags and empty containers would be generated. Additionally, there is the potential for spills or releases of fuels, coolants, oils and hydraulic fluids from construction machinery. All of these waste streams would be generated in very limited quantities. Table 3-9 summarizes potential solid waste streams that would result during the construction phase of Alternative B.

**Table 3-9. Typical Nonhazardous Wastes Generated During Construction**

| Waste | Estimated Quantity | Composition | Disposal |
|---|---|---|---|
| Land clearing wastes-stumpage | 48 to 240 tons | Stumps, non-harvestable wood, vegetation | Dispose of in a Class III or IV landfill or burned onsite in accordance with state open burning regulatory requirements . |
| Non-usable soils | 9,500 to 45,000 $yd^3$ | Rock, chert, poor soils | Dispose of in a Class III or IV Landfill |
| Asphalt milling/concrete | 1,400 to 2,100 tons | Asphalt, concrete | Reuse dispose of in a Class III or IV landfill in roads and fill |
| Demolition debris | less than 300 $yd^3$ | Metal and PVC pipe, metal conduit, masonry block | Dispose of in a Class III or IV landfill |
| Contaminated soils | Limited | Various hazardous constituents from residential burn and disposal pits | Dispose of in a Class I landfill as special wastes |
| Scrap wood, steel, glass, plastic, paper, insulation | Limited | Normal refuse | Recycle and/or dispose of in a Class I landfill |
| Empty hazardous material containers | Limited | Containers <5 gallon | Recycle or dispose of in a Class I landfill |
| Waste oil filters | Limited | Oil from construction equipment, leachate pumps, etc. | Recycle at a permitted Treatment, Storage and Disposal Facility |
| Oil fuel and solvent rags | Limited | Lubricating oils/hydrocarbons from small spills, cleaning and degreasing operations | Dispose at a Class I landfill as special wastes |
| Non-hazardous solvents, paint, adhesives | Limited | Solvents, paints and adhesives that are not characteristic or listed hazardous waste | Dispose at a Class I landfill as special waste |
| Sanitary waste | Portable toilet holding tanks | Solids and liquids | Remove by contracted sanitary service |

The proposed construction activity would use limited quantities of regulated materials. Examples of hazardous materials used during site preparation and construction may include fuels, lubricating oils, solvents, paints, adhesives and compressed gases. On-site management of these wastes would be performed in accordance with RCRA requirements and TVA BMPs that implement RCRA regulations and that include additional procedures intended to prevent spills or other releases. Appropriate spill prevention, containment and disposal requirements for hazardous materials would be implemented to protect construction and plant workers, the public and the environment. Impacts associated with the use of fuels, oil, lubricants and the limited quantities of other hazardous materials during construction are expected to be negligible.

There would be a minor increase in solid and hazardous waste generated during construction. These materials would be handled and disposed of per applicable state and federal requirements.

#### 3.14.2.2.2 Operation

Operation of Alternative B would not change the quantity of CCR wastes generated at BRF annually. Under this Alternative, BRF would continue to generate 240,000 tons per year of fly ash and bottom ash and 318,000 tons per year of gypsum wastes from flue gas desulfurization (FGD). These are the primary waste streams associated with both the current situation and Alternatives B and C.

Other solid waste streams associated with operation of the proposed landfill would be limited in quantity. Maintenance of the haul road would involve periodic cleaning roadside ditches to improve or provide drainage. The wastes generated from these activities would consist primarily of vegetative detritus such as tree limbs, leaves, grass, or other vegetation periodically eliminated by herbicide application in accordance with existing practices. Such wastes would also be generated on a periodic basis from maintenance of drainage ditches associated with the landfill run-on/run-off controls. It is anticipated that these wastes would be generated one time per year but the quantities cannot be accurately predicted. These wastes may be disposed of off-site at a Class III or IV landfill or may be composted.

Periodic clean-out of the storm water basins would result in soils and vegetative wastes. Clean-out of the storm water retention basins is likely to occur only once or twice over the lifespan of the proposed landfill. Each cleanout event would generate a waste volume of approximately 30 to 50 percent of the combined capacities of the three basins. These wastes may be disposed of off-site at a Class III or IV landfill. It may be possible during the operational phase of the proposed landfill for these wastes to be dried on-site, screened and blended for use in cover soils. However, if any ash has become incorporated in the wastes as a result of incidental losses during transport or from wind dispersal, the material could not be used in the landfill cover.

With the exception of the CCR, the largest solid waste stream that would be routinely generated from operation of the proposed landfill is leachate wastewater treatment sludge. The proposed design provides for a leachate storage volume of at least 1,650,000 gallons at the leachate management system at the landfill. Under Tennessee Rule 0400-11-01-.04(4)(a)(7), landfills are required to have a minimum leachate storage capacity of at least 30 days and, therefore, the indicated volume was considered the monthly leachate generation rate. In order to develop a preliminary order of magnitude estimate of the generation rate for the wastewater treatment sludge, the mean concentration of metals in the Toxicity Characteristic Leaching Procedure extract concentrations from the BRF bottom ash and fly ash was used. Concentrations for other wastewater discharge metals (except iron) were estimated directly from ash pond discharge concentrations. The wastewater sludge was assumed to be approximately 15 percent solids, which is within the typical range after mechanical dewatering. Based on this approach, the monthly rate of wastewater sludge generation associated with this alternative was preliminarily estimated to be 2.3 to 4.6 tons per month (approximately 40 tons or 800 $ft^3$ per year).

Other solid wastes that would be generated from operation of the proposed landfill include paper and plastics from packaging of maintenance-related materials, small quantities of oils and fuels from spills, small quantities of paints, adhesives, etc. from maintenance. Pumps, valves and controls associated with the leachate management system would require replacement during operations. These components would be managed as solid waste upon replacement.

Various hazardous wastes, such as used oils, hydraulic fluids and engine coolants could be produced during landfill operations. These wastes would be temporarily stored in properly managed hazardous waste storage areas on-site. Appropriate spill prevention, containment and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public and the environment.

There would be a long-term impact on the management of solid wastes at BRF as CCR produced at the facility would be disposed in a new landfill.

#### 3.14.2.2.3 Post-Closure Care

The primary solid wastes that would result during post-closure care are vegetative detritus and soils from maintenance of the road drainage swales, sludge from periodic clean-out of the storm water basins, sludge from leachate treatment and wastes from cleanout of the leachate collection system. The wastes generated from periodic maintenance of the road drainage swales and run-on/run-off controls would consist primarily of vegetative detritus such as tree limbs, leaves, grass or other vegetation periodically eliminated by herbicide application. It is anticipated that these wastes would be generated annually.

The storm water basins would need to be dredged periodically during post-closure care. The volume of waste generated from each event would be 30 to 50 percent of the combined capacities of the basins.

The largest volume waste stream that would be generated during post-closure care would be sludge from leachate treatment. Leachate treatment is estimated to generate approximately 1,200 tons or 900 $yd^3$ of sludge during post-closure care.

Other small volume solid waste streams that would be generated during post-closure care include pure water from groundwater sampling, lubricating oils and filters from construction equipment and pumps associated with the leachate collection system, small quantities of oils and fuels from spills, small quantities of paints, adhesives etc. from maintenance.

TVA would manage all solid waste generated from construction, operation and post-closure activities in accordance with standard procedures for spill prevention and cleanup and waste management protocols in accordance with pertinent federal, state and local requirements.

Therefore, no measurable direct or indirect adverse effects related to solid or hazardous wastes are anticipated from closure activities.

### 3.14.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

#### 3.14.2.3.1 Construction

The primary potential issues concerning solid and hazardous wastes with respect to the proposed action are: (1) the potential for increased generation from operation of the proposed action; and (2) the potential for a spill or release during operations or transportation.

TVA has not indicated any need to construct a loading or storage facility in conjunction with Alternative C. Therefore, typical construction related hazardous wastes or solid wastes such as soils and landscaping wastes from site preparation would not be generated. No construction rubble from land clearing operations, removal of paving and disposal of excess material would be generated.

#### 3.14.2.3.2 Operation

Operation of Alternative C would not change the quantity of CCR wastes generated annually by BRF. Under this alternative, quantities of CCR wastes as described in Table 3-7 would be placed within an existing permitted landfill such as Chestnut Ridge. Therefore, this alternative would result in solid waste disposal that would have an effect on the lifespan of Chestnut Ridge and its long-term ability to meet disposal needs of the region.

Truck washing may be required prior to leaving BRF for transport along public highways. Additional solid wastes from truck washing would include sludges from sediment traps and waste oil/water admixtures from oil traps.

Relative to current generation rates, the quantity of equipment maintenance related solid and hazardous wastes would increase substantially under Alternative C. These wastes include used lubricating oil, used hydraulic fluids, coolants, oily sorbents and rags, waste fuel, batteries and lamps. Due to the greater number of vehicles needed to transport CCR daily to an offsite landfill, quantities of these materials generated under this alternative would be greater than Alternative B.

Most other solid waste streams associated with operation of this alternative would be limited in quantity and include paper and plastics from packaging of maintenance related materials, small quantities of paints, adhesives, etc. from maintenance. These components would be managed as solid waste upon replacement.

All solid waste generated as a result of the transport of CCRs to the offsite landfill would be handled in accordance with standard procedures for spill prevention and cleanup and waste management protocols in accordance with pertinent federal, state and local requirements.

Based on the anticipated fleet requirements, TVA may decide to contract transportation services. Under these circumstances, solid and hazardous waste streams would not be generated directly by TVA.

## 3.15 Socioeconomics

### 3.15.1 Affected Environment

Socioeconomic characteristics of resident populations are assessed using 2010 Census and 2009-2013 American Community Survey 5-year estimates. Employment and housing information is provided by the 2009-2013 American Community Survey.

Socioeconomic characteristics of the potentially affected population are assessed within a 5-mi radius buffer around the proposed landfill at Site J and the existing landfill at Chestnut Ridge. The geography included in the 5-mi radius for these areas overlap and extend into Anderson and Knox counties. Therefore, Anderson County, Knox County and the state of Tennessee are included as appropriate secondary geographic areas of reference. Comparison at multiple scales provides a more effective definition for socioeconomic factors that may be affected by the proposed action including minority and low income populations.

#### 3.15.1.1 Demographics

Demographic characteristics of the study area are summarized in Table 3-10. The communities surrounding Site J and the Chestnut Ridge Landfill are primarily rural with most of the population located within the cities of Oak Ridge, Clinton and Knoxville (U.S. Census Bureau [USCB] 2015a). This is reflected in the population of the community around Site J and the Chestnut Ridge Landfill, which encompass areas that are proximate to these cities. Since 2000, the population around Site J and the Chestnut Ridge Landfill has increased by approximately 2 and 4 percent respectively, which is similar to the population change in the state of Tennessee. However, during this same period, population increases in Anderson County and Knox County were smaller (0.5 percent and 1.1 percent respectively).

Age characteristics of the region surrounding Site J and the Chestnut Ridge Landfill are comparable to Anderson County, Knox County and Tennessee. Persons under the age of 18 are similar to the reference areas. There is a relatively greater percentage of older persons (greater than 65 years) in Anderson County than in the communities surrounding Site J and the Chestnut Ridge Landfill. Knox County has the lowest percentage of persons over 65 years, however, these communities reflect state percentages.

#### 3.15.1.2 Economic Conditions

Employment characteristics for the communities surrounding Site J and the Chestnut Ridge Landfill are summarized on Table 3-11. The total employed civilian population within the communities surrounding Site J and the Chestnut Ridge Landfill is 29,428 and 21,071, respectively. Approximately 9 percent of the civilian labor force in the community surrounding Site J is unemployed, which is comparable to the community surrounding the Chestnut Ridge Landfill (8.4 percent). The unemployment rate in these communities is lower than the unemployment rate in Anderson and Knox counties (8.9 and 7.3 percent, respectively) and the State of Tennessee (10.1 percent). Median household income for the subject communities was $59,256 for the community surrounding Site J and $52,724 for the community surrounding the Chestnut Ridge Landfill. These incomes are greater than those reported for Anderson and Knox County and the State of Tennessee (see Table 3-10).

**Table 3-10. Demographic Characteristics**

| | Site J 5-mi Radius | Chestnut Ridge Landfill 5-mi Radius | Anderson County | Knox County | State of TN |
|---|---|---|---|---|---|
| **Population** | | | | | |
| Population, 2013 estimate | 71,666 | 52,695 | 75,494 | 436,983 | 6,346,105 |
| Population, 2010 | 70,249 | 50,459 | 75,129 | 432,226 | 6,346,105 |
| Percent Change 2010-2013 | 1.9% | 4.2% | 0.5% | 0.01% | 2.4% |
| Persons under 18 years, 2013 | 23.0% | 24.1% | 21.1% | 25.0% | 23.0% |
| Persons 65 years and over, 2013 | 15.5% | 14.6% | 18.5% | 13.4% | 14.7% |
| **Racial Characteristics** | | | | | |
| White Alone, 2013[(a)] | 93.2% | 96.9% | 92.2% | 86.2% | 79.1% |
| Black or African American, 2013[(a)] | 2.8% | 1.2% | 4.2% | 9.2% | 16.7% |
| American Indian and Alaska Native, 2013[(a)] | 0.2% | 0.1% | 0.4%s | 0.2% | 0.4% |
| Asian, 2013[(a)] | 1.8% | 0.4% | 1.2% | 1.9% | 1.6% |
| Native Hawaiian and Other Pacific Islander, 2013[(a)] | 0 | 0 | 0 | 0 | 0.1% |
| Two or More Races, 2013 | 1.3% | 1.1% | 1.9% | 1.5% | 1.7% |
| Hispanic or Latino, 2013[(b)] | 2.8% | 1.5% | 2.4% | 3.6% | 4.6% |
| **Housing** | | | | | |
| Housing Units, 2013 | 30,932 | 21,689 | 34,591 | 195,981 | 2,840,914 |
| Median Household Income, 2009-2013 | $59,256 | $52,724 | $43,620 | $47,694 | $44,298 |
| Persons Below Poverty Level, 2009-2013 | 9.5% | 10.7% | 18.2% | 14.6% | 17.6% |

Sources: USCB 2015a and USCB 2015b
(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.

**Table 3-11. Employment Characteristics**

| | Site J 5-mi Radius[1] | Chestnut Ridge Landfill 5-mi Radius[1] | Anderson County | Knox County | State of TN |
|---|---|---|---|---|---|
| Population Over 16 years | 73,492 | 53,506 | 60,940 | 352,789 | 5,078,433 |
| Civilian Labor Force | | | | | |
| Employed | 29,428 | 21,071 | 31,140 | 210,719 | 2,806,948 |
| Unemployed | 2,882 | 1,941 | 3,054 | 16,683 | 316,682 |
| Subtotal | 32,310 | 23,012 | 34,194 | 227,402 | 3,123,630 |
| Unemployment | | | | | |
| Percent of Total Population | 3.9% | 3.6% | 5.0% | 4.7% | 6.2% |
| Percent of Civilian Labor Force | 8.9% | 8.4% | 8.9% | 7.3% | 10.1% |

Source: USCB 2015a

[1] Labor force data is not available at the block level, so data presented represents census tracts within a 5-mi radius of Site J and the Chestnut Ridge Landfill

The largest percentage of civilian employees in Anderson County are employed in the educational services, health care and social services industries (22.7 percent), followed by professional, scientific and management (including administrative and waste management services) (14.7 percent) and retail trade and manufacturing (13.0 percent and 12.9 percent respectively. This is similar to Knox County where business sectors providing the greatest employment are education services, health care and social services (24.4 percent), retail trade (13.1 percent) and professional, scientific and management (including administrative and waste management services) (12.7 percent). However, a greater percentage of persons in Anderson County are employed in the manufacturing sector than those in Knox County (12.9 percent for Anderson County versus 7.5 percent for Knox County) (USCB 2015a). Based on current commuting patterns and on proximity, the labor market area is defined to include all adjacent counties (USCB 2015a).

### 3.15.1.3 Community Facilities and Services

Community facilities and services are public or publicly funded facilities such as police protection, fire protection, schools, hospitals and other health care facilities, libraries, day-care centers, churches and community centers. Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and affect the delivery of such services. When applicable, the study area for the evaluation of impacts to community services is the service area of various providers, otherwise a secondary study area defined for the purposes of a socioeconomic analysis may be defined. As there are no direct impacts to community services associated with any of the alternatives, the study area for community impacts is defined as those areas proximate (within a half mile) of the proposed landfill site and around the existing Chestnut Ridge Landfill.

Services available to the communities surrounding Site J and the Chestnut Ridge Landfill include hospitals, fire and emergency services, law enforcement, churches and schools. The Valley View Church and Cemetery and the Church of Christ are located proximate to Site J (Figure 3-7).

There are no community facilities within a half mile of the Chestnut Ridge Landfill. The Claxton Elementary School, eight churches and a cemetery are located adjacent to the route that would be used to haul CCR to the Chestnut Ridge Landfill (see Figure 3-7).

#### 3.15.1.4 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address EJ in minority and low income populations. This EO mandates some federal-executive agencies to consider Environmental Justice (EJ) when identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations. While TVA is not subject to this EO, TVA applies it as a matter of policy.

The analysis of the impacts of landfill activities on EJ issues follows guidance issued by CEQ under NEPA (CEQ 1997). The analysis of EJ impacts has three parts:

1. Identification of the geographic distribution of low-income and minority populations in the affected area.

2. An assessment of whether the impacts of closure activities would produce impacts that are high and adverse.

3. If impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

In the event that impacts are significant, disproportionality will be determined by comparing the proximity of any high and adverse impacts to the locations of low-income and minority populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations.

The CEQ defines minority as any race and ethnicity, as classified by the USCB as: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997).

Identification of minority populations requires analysis of individual race and ethnicity classifications as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the impacted area exceeds 50 percent of the total population.
- The ratio of minority population is meaningfully greater (i.e., greater than or equal to 20 percent) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).


**Figure 3-7. Community Facilities – Site J and the Surrounding Area**

Potentially affected communities were defined as any census block group that contained either of the proposed landfill sites (Site J or the Chestnut Ridge Landfill) or along the haul route used to transport CCR to the Chestnut Ridge Landfill. Demographic data by block group were then compared to data for Anderson and Knox counties. Total minority populations (i.e., all non-white racial groups combined and Hispanic or Latino) comprise between 2.0 to 5.0 percent of the population of the block groups containing Site J and between 0 and 2.0 percent of the block groups along surrounding the Chestnut Ridge Landfill. Minorities comprise 0 to 5.0 percent of the block groups along the haul route to the Chestnut Ridge Landfill. The minority populations within the block groups studied did not exceed 50 percent of the total population and did not significantly exceed rates for Anderson County (10 percent minority).

Low income populations are based on annual-statistical poverty thresholds also defined by the USCB. Low-income populations are those with incomes that are less than the poverty level (CEQ 1997). The 2015 Health and Human Services Poverty Guidelines states that, an annual household income of $24,250 for a family of four is the poverty threshold. For an individual, an annual income of $11,770 or less is below the poverty threshold. A low-income population is identified if either of the following two conditions are met:

- The low income population exceeds 50 percent of the total number of households.
- The ratio of low income population significantly exceeds (i.e., greater than or equal to 20 percent) the appropriate geographic area of analysis.

The percentages of households within each block group adjacent to the proposed landfills and the haul route to the Chestnut Ridge Landfill living below the poverty threshold range from 0 to 20 percent. The low income populations within these block groups did not exceed 50 percent of the total population in the given block group and did not significantly exceed corresponding rates for Anderson County (16.0 percent). However, because specific income information is not available at the block level, smaller populations, such as the trailer park located east of BRF on the south side of SR 170 (Edgemoor Road) may not be identified in this analysis as an EJ population. It is probable that persons in this area should also be considered as a sensitive low-income population subject to EJ considerations.

### 3.15.2 Environmental Consequences

#### 3.15.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the current dry fly ash stack for as long as capacity is available. There would be no change in local demographics, economic conditions, or community services under the No Action Alternative. In the long term, however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, potentially significant effects on employment, local tax base and secondary economic impacts associated with a reduction in workforce could occur. However, because any impact to operations at BRF would not be consistent with TVA’s long range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

### 3.15.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

#### 3.15.2.2.1 Demographic and Employment Impacts

Demographic characteristics of the project area would be expected to change temporarily in response to an increased construction workforce, but this change would not be significant. The on-site construction workforce is estimated to be 35 workers during the initial construction phase (i.e., site preparation and haul road construction). Five permanent workers would be employed during operation of the landfill. These workers could be drawn from the labor force that currently resides in the study area. Consequently, no long-term or significant impacts to local demographics are expected.

#### 3.15.2.2.2 Economic Impacts

Potential economic impacts associated with the proposed project relate to direct and indirect effects of the construction and long-term operation of the proposed landfill. Construction activities would entail a temporary increase in employment and associated payrolls, the purchases of materials and supplies and procurement of additional services. Capital costs associated with the proposed action would, therefore, have direct economic benefits to the local area and surrounding community. Revenue generated by sales tax collected from purchases by new workers would benefit the local economy. Additionally, some beneficial secondary impacts to the economy are also expected in conjunction with the multiplier effects of construction activities. For example, the hospitality and service industries would benefit from the demands brought by the increased construction work-force. However, given the relatively small magnitude of the anticipated construction and workforce, this beneficial impact is considered to be minor. Long-term direct and indirect beneficial impacts related to employment would be negligible given the anticipated size of the permanent workforce.

#### 3.15.2.2.3 Community Facilities and Services

Construction and operation of a landfill for storage of CCR at Site J would not result in the displacement of or direct impacts to community facilities.

The Valley View Church and cemetery and the Church of Christ are located proximate to the proposed landfill site (see Figure 3-7). Although access to these facilities will be maintained, there may be some impact to ease of movement to these facilities during initial construction of the landfill due to the construction-related traffic. This impact would be minor given the intermittent use of these churches and the temporary nature of initial construction activities.

#### 3.15.2.2.4 Environmental Justice

There would be no direct impact to EJ communities under this alternative. However, one area that may contain a sensitive low income population subject to EJ considerations is located on the south side of SR 170 (Edgemoor Road) and extends to Old Edgemoor Lane just north of Site J. Landfill construction may result in adverse effects to the residents in this location associated with increased noise, exposure to fugitive dust, exhaust emissions, vibrations, increased traffic and generation of solid wastes. During operation, the landfill also may present a visual impact as well as impacts related to fugitive dust and noise. Dust control measures designed to meet permit requirements would be implemented and operational noise attenuates to acceptable levels at the nearby residential areas. Visual and noise impacts would be further mitigated by the construction of a landscape screen along the northern boundary of Site J. The haul road would be constructed on BRF property at an even greater distance from the potential EJ population, and the transport of CCR to the landfill is not expected to result in adverse effects to this local EJ population. Therefore, potential effects to this population is considered to be minor to moderate in nature.

It should also be noted that opportunities would be provided to residents with some construction phase employment, which would provide potential positive impacts to area low-income populations.

#### 3.15.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

##### 3.15.2.3.1 Demographic and Employment Impacts

There would be no change in demographic characteristics of the study area under this alternative. The Chestnut Ridge Landfill is already constructed and therefore no temporary workforce would be needed. Five permanent workers would be employed during operation of the landfill. These workers could be drawn from the labor force that currently resides in the study area and, therefore, no long-term or significant impacts to local demographics are expected.

##### 3.15.2.3.2 Economic Impacts

Potential economic impacts associated with this alternative would be similar to those described for Alternative B. However, positive economic impacts would be much smaller as no construction-related direct and indirect beneficial impacts would be realized. Revenue generated by income tax and sales tax from new workers would benefit the local economy. However, given the relatively small magnitude of the anticipated workforce, this impact is considered to be negligible.

##### 3.15.2.3.3 Community Facilities and Services

No displacements would occur under this alternative, and there are no community facilities proximate to the Chestnut Ridge Landfill. There would be no change in travel patterns or access to the facilities that are located adjacent to the haul route to the Chestnut Ridge Landfill. However, there may be some impact to ease of movement to community facilities proximate to the haul route due to the additional trucks on the roadway transporting CCR to the landfill. However, as noted in Section 3.17 (Transportation), these potential localized impacts are anticipated to be minor to moderate. Transport of CCR generated at BRF to the Chestnut Ridge Landfill is expected to be carried out by local contractors, and no significant relocations to the area are anticipated. Therefore, local fire, police, medical or educational services would not be affected.

##### 3.15.2.3.4 Environmental Justice

There would be no direct impact to EJ communities under Alternative C. However, one area that may contain a sensitive low-income population subject to EJ considerations was identified on the south side of SR 170 (Edgemoor Road). It is possible that there would be a long-term indirect impact to this community due to the additional traffic, noise and dust from the trucks transporting CCR to the landfill. Although this impact would be minor to moderate from a transportation perspective, the addition of 23 truck trips per hour (over a 9-hour workday) passing this community over an extended period of time (approximately 15.5 years) could impact the individuals living in the community. This impact would be minimized through the use BMPs to minimize emissions of fugitive dust and transport of CCR would only occur during normal working hours. Therefore, this impact is considered to be moderate but would not be disproportionate as it would be consistent across all communities (EJ and non EJ) along the haul route.

## 3.16 Natural Areas, Parks and Recreation

### 3.16.1 Affected Environment

Natural areas include managed areas, ecologically significant sites and streams listed in the Nationwide Rivers Inventory system. This section addresses natural areas that are on, immediately adjacent to (within 0.5 mi) or within the region of the proposed Site J landfill (5-mi radius).

The Claxton Community Park is located within 0.5 mi of the Site J project area. This park contains a community center, playground and athletic fields. Review of the TVA Regional Natural Heritage database indicates that there are no other managed areas or ecologically significant sites within or in the vicinity (0.5 mi) of the proposed Site J. However, Brushy Valley Park and Lower Bull Run Bluffs Habitat Protection Area (HPA) are located within 1 mi of the proposed landfill site.

Brushy Valley Park is approximately 0.9 mi east from the proposed project area. This small 9.8-ac park is on the north side of Bullrun Creek and is managed by the Anderson County Conservation Board. Lower Bull Run Bluffs TVA HPA is approximately 0.7 mi southeast from the proposed project area. This 3.57-ac HPA features bluffs with deciduous forest and some rock outcrops that provide habitat for ginseng and saxifrage.

As illustrated on Figure 3-8, several natural and recreation areas are located within 5 mi of the proposed project. These include 15 TVA HPAs, recreational areas at the Oak Ridge Reservation and 17 public parks and recreational facilities.

In Anderson County, the Clinch River is listed on the Nationwide Rivers Inventory by the U.S. National Park Service from CRM 47, upstream to CRM 73, below Norris Dam (TVA 2012). The Nationwide Rivers Inventory  is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential Directive, and related CEQ procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more Nationwide Rivers Inventory segments.

Under the Tennessee Scenic Rivers Program, the State of Tennessee recognizes the section of the Clinch River from Melton Hill Dam upstream to the Pellissippi Parkway (SR 62) as a Class III Partially Developed River. A partially developed river is defined by TDEC as rivers or sections of rivers that are free flowing, unpolluted and with shorelines and vistas essentially more developed (TDEC 2015). The Tennessee Scenic Rivers Program is a voluntary community-based partnership intended to preserve and protect the free flowing, unpolluted and outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic or cultural values of selected rivers or river segments in the state (Tennessee Scenic Rivers Association 2015).

### 3.16.2 Environmental Consequences

#### 3.16.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the current disposal areas for as long as capacity is available. There would be no change in existing CCR disposal operations and, therefore, no impact to natural areas, parks, or recreation.

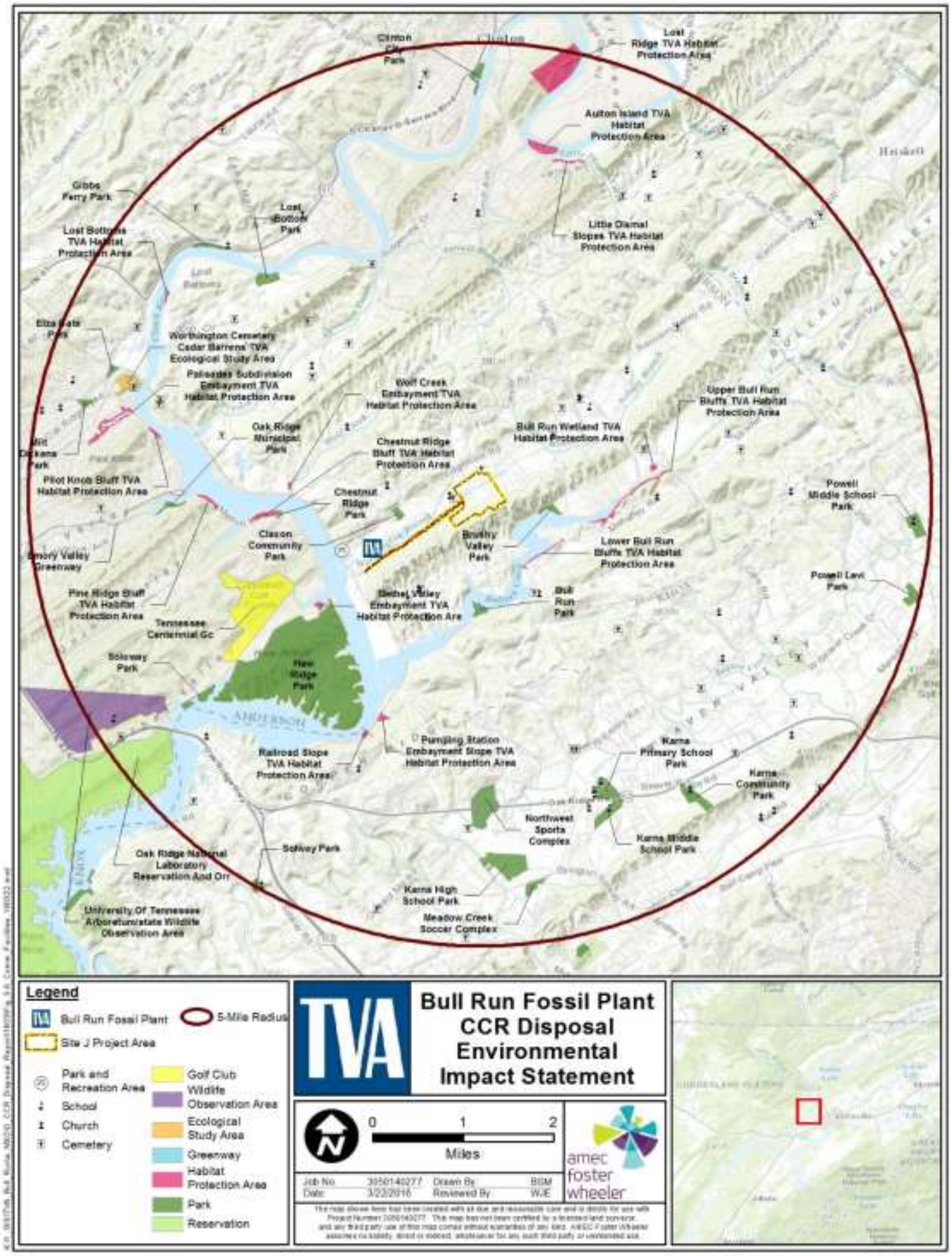


**Figure 3-8. Natural Areas and Parks within the Vicinity of Site J**

#### 3.16.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under Alternative B, TVA would construct the CCR landfill in an area that is adjacent to an existing industrial use. There are no parks or recreational areas located on or adjacent to Site J. The Claxton Community Park is located approximately 0.5 mi west of the proposed landfill site, and other parks and natural areas identified in Figure 3-8 are located greater than 1 mi away from the proposed landfill site. Therefore, no direct impact to natural areas, parks or recreational facilities as a result of construction or operation of the proposed landfill is anticipated.

However, some construction-related traffic would likely use SR 170. Recreational users of facilities along this road (the parking lot on the south side of SR 170 just east of the Clinch River Bridge utilized by fisherman to access the Clinch River, Haw Ridge Park, the Centennial Golf Course, Soloway Park and Claxton Community Park) would potentially be indirectly impacted by increased traffic, fugitive dust and noise generated during the initial landfill construction period. This impact would be minor and would not impair use or enjoyment of these resources given implementation of BMPs designed to minimize fugitive dust and the temporary and intermittent nature of construction. Once constructed, CCR generated at BRF would be transported on-site, and there would be no impact to these resources.

#### 3.16.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

As with Alternative B, there would be no direct impact to natural areas, parks or recreational areas under this alternative.

There is a potential for indirect impacts to natural areas, parks and recreational areas associated with hauling CCR to the Chestnut Ridge Landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Volunteer RV Park and Escapees Raccoon Valley RV Park are located adjacent to SR 170. However, unlike Alternate B, it is possible that there would be a long-term indirect impact to users of these facilities due to the additional traffic, noise and dust from the trucks transporting CCR to the landfill. The impact to the use or enjoyment of these resources would be moderate given the projected increase in truck traffic (100 truckloads which results in a traffic count of 200 trips) relative to the existing traffic along this portion of the roadway and the duration of the project (approximately 15.5 years).

## 3.17 Transportation Analysis

### 3.17.1 Affected Environment

BRF is served by highway, railway and waterway modes of transportation. The transportation network surrounding BRF contains roads and bridges, rail lines and navigable waterways. Nearby, major interstates include I-75 and I-40. Traffic generated by operations at BRF is expected to be composed of a mix of cars and light duty trucks as well as medium duty to heavy duty trucks. Site J is located on TVA-owned property and is bordered by Old Edgemoor Lane to the north, New Henderson Road to the west and Isabella Lane to the east. Chestnut Ridge is an existing landfill located approximately 12 mi northeast of BRF.

State highways provide ample access in the immediate vicinity of BRF. Principal access at BRF is via SR 170, which is two lanes wide. US 25W, a four-lane roadway, is approximately 3.2 mi east of BRF. West of US 25W, SR 170 is known as Edgemoor Road, east of

US25W, SR 170 becomes Raccoon Valley Road, which is two lanes wide and continues to I-75 approximately 6.8 mi to the east. Chestnut Ridge landfill lies just north of Raccoon Valley Road and just west of I-75.

The 2014 Annual Average Daily Traffic (AADT) on the roadways in the immediate vicinity of BRF for SR 170 (Edgemoor Road) and SR 170 (Raccoon Valley Road) are indicated in Table 3-12.

**Table 3-12. Average Daily Traffic Volume (2014) on Roadways in Proximity to BRF**

| Roadway | Existing AADT |
|---|---|
| SR 170 (Edgemoor Road) between BRF and US 25W/SR 9 | 14,923 |
| SR 170 (Raccoon Valley Road) just east of US 25W | 4,095 |
| SR 170 (Raccoon Valley Road) just west of Heiskell Road | 3,406 |

Source: Knoxville TPO 2014

### 3.17.2 Environmental Consequences

#### 3.17.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the current landfill as long as capacity is available. There would be no change in existing CCR disposal operations and, therefore, no impacts to transportation and local roads are anticipated.

#### 3.17.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this alternative, CCR from the dewatering facility would be transported to Site J via a newly constructed haul road on TVA property. This haul road would extend northeast from an existing TVA haul road to Site J. New Henderson Road would be maintained on its current alignment while the new haul road will pass over it on a new private bridge. This minimizes any impact to New Henderson Road and would only result in minimal impacts to traffic during construction.

Based on the estimate of CCR produced daily (see Table 3-7), and the capacity of an articulated dump truck, 65 truckloads of CCR per day would be needed to transport CCR to the proposed landfill. Transport of CCR would occur daily (for a typical five-day work week) over the life of the landfill (estimated to be approximately 15.5 years). This would result in a traffic count of 130 trips per day along the haul road or approximately 15 truck trips per hour over a typical nine-hour workday. The use of the new haul road keeps the trucking of CCR off of public roadways, which has a benefit to the safety of traveling public.

Under this alternative, the hauling of CCR generated at BRF would not use public roadways; therefore, the transport of CCR would not directly impact traffic and levels of service on local roads. Minor impacts to traffic would occur during installation of bridge components. However, this impact would be temporary and would not require rerouting or road closure for any significant period of time. Once constructed, traffic on New Henderson Road would be separated from landfill haul road traffic and would not be impacted by haul road truck movements.

### 3.17.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill, the Chestnut Ridge Landfill.

The haul route to the Chestnut Ridge landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic (see Figure 2-4). Therefore, for this alternative any resources along the haul route are already subjected to vehicular traffic destined for the landfill and no new roads would need to be constructed.

Over-the-road tandem dump trucks would be used to haul CCR between BRF and the Chestnut Ridge Landfill along the haul route described above. Based on the estimate of CCR produced daily (see Table 3-7) and the capacity of an over-the-road tandem dump truck, 100 truckloads of CCR would be needed to transport CCR generated at BRF to the Chestnut Ridge Landfill. Transport of CCR would occur daily (during a typical five-day work week) over a period of approximately 15.5 years to accommodate long-term disposal of CCR generated at this facility). This would result in a traffic count of 200 trips per day along the haul route or approximately 23 truck trips per hour over a typical nine-hour workday. The number of trips per day is higher for Alternative C than it is for Alternative B because Alternative B would use larger articulated dump trucks to haul CCR over the new TVA haul road. With Alternative C, hauling of CCR is over public roadways and smaller tandem dump trucks must be used instead of the larger articulated dump trucks. The effects of these trips on roads along the haul route are shown in Table 3-13.

**Table 3-13. Traffic Impacts Associated with Hauling CCR to Chestnut Ridge Landfill from BRF**

| Roadway | Existing AADT* | Existing Traffic with CCR Hauling Traffic (AADT) | Traffic Increase |
|---|---|---|---|
| SR 170 (Edgemoor Road) between BRF and US 25W/SR 9 | 14,923 | 15,123 | 1.34% |
| SR 170 (Raccoon Valley Road) just east of US 25W | 4,095 | 4,295 | 4.88% |
| SR 170 (Raccoon Valley Road) just west of Heiskell Road | 3,406 | 3,606 | 5.87% |

* Source: Knoxville TPO 2014.

The existing traffic volumes on Raccoon Valley Road are relatively low for a two-lane road. Existing levels of service (LOS) on Raccoon Valley Road are LOS B. LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions and comfort and convenience. LOS is described accordingly:

- LOS A: free flow traffic conditions
- LOS B: free flow conditions although presence of other vehicles begins to be noticeable
- LOS C: increases in traffic density become noticeable but remain tolerable to the motorist

- LOS D: borders on unstable traffic flow; the ability to maneuver becomes restricted; delays are experienced
- LOS E: traffic operations are at capacity; travel speeds are reduced, ability to maneuver is not possible; travel delays are expected; and
- LOS F: designates traffic flow breakdown where the traffic demand exceeds the capacity of the roadway; traffic can be at a standstill.

Under Alternative C, hauling of CCR generated at BRF would add 200 trips per day (23 trips per hour over a typical nine-hour workday) on SR 170 (Raccoon Valley Road) (an increase of roughly 5 percent). This increase results in a minor impact on the traffic flow on Raccoon Valley Road, but would not change the existing LOS as there is sufficient capacity remaining on this road to handle the increase in truck traffic resulting from hauling of CCR from BRF.

However, on SR 170 (Edgemoor Road) which is also a two-lane roadway, potential localized minor to moderate impacts may occur as a result of hauling CCR to the Chestnut Ridge Landfill. Peak hour delays are known to occur along SR 170 (Edgemoor Road). The existing (2014) traffic volume on SR 170 (Edgemoor Road) east of BRF is 14,923 vehicles per day, and the road is congested during peak hours of the day. The addition of CCR haul road traffic from BRF would have a minor to moderate impact on traffic east of BRF during peak hours of the day. Ingress/egress turning movements of construction traffic at BRF may at times be difficult and lead to unsafe conditions especially during peak hours. These additional truck turning movements may adversely impact the existing LOS along Edgemoor Road in front of the BRF facility.

The proposed hauling of CCR over public roadways would contribute to the number of vehicle miles traveled on those roadways, which is a factor in injury and fatal traffic crash rates. The number of truck-related crashes associated with the hauling of CCR from BRF could increase and could compromise driver safety. Therefore, while the impacts of the additional CCR haul traffic on SR 170 (Edgemoor Road) may be absorbed, localized effects on traffic flow and safety may be evident.

Otherwise on the remainder of the road network, which has relatively low traffic volumes, the percentage increases in traffic resulting from the transport of CCR from BRF are negligible and the impacts are expected to be minor.

Therefore, in consideration of the localized impacts associated with the increase in traffic on SR 170 (Edgemoor Road) and the potential safety implications associated with the increase in truck traffic, implementation of this alternative would have a moderate impact on transportation as a result of transport of CCRs from BRF.

## 3.18 Visual Resources

### 3.18.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service and integrated with planning methods used by TVA. The classification process is also based on fundamental methodology and descriptions adapted from Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook Number 701 (U.S. Forest Service 1995).

The visual landscape of an area is formed by physical, biological and man-made features that combine to influence both landscape identifiability and uniqueness. Scenic resources within a landscape are evaluated based on a number of factors that include scenic attractiveness, integrity and visibility. Scenic attractiveness is a measure of scenic quality based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures and visual composition of each landscape. Scenic integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. The varied combinations of natural features and human alterations both shape landscape character and help define their scenic importance. The subjective perceptions of a landscape's aesthetic quality and sense of place is dependent on where and how it is viewed.

Scenic visibility of a landscape may be described in terms of three distance contexts: (1) foreground, (2) middleground and (3) background. In the foreground, an area within 0.5 mi of the observer, individual details of specific objects are important and easily distinguished. In the middleground, from 0.5 to 4 mi from the observer, object characteristics are distinguishable but their details are weak and they tend to merge into larger patterns. In the distant part of the landscape, the background, details and colors of objects are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. In this assessment the background is measured as 4 to 10 mi from the observer. Visual and aesthetic impacts associated with a particular action may occur as a result of the introduction of a feature that is not consistent with the existing viewshed. Consequently, the character of an existing site is an important factor in evaluating potential visual impacts.

For this analysis, the affected environment is considered to include the proposed Site J landfill, associated near off-site temporary use areas and any sensitive receptors along the haul routes to either alternative site as well as the physical and biological features of the landscape. The proposed Site J landfill is located east of the existing fly ash stack and consists of lands formally used for residential development. TVA previously planted rows of trees along the edge of the property facing Old Edgemoor Lane. The existing BRF facility is located along the bank of the Clinch River. The surrounding region is largely undeveloped with some pockets of residential and commercial developments. The surrounding area is characterized by ridge and valley topography, which has likely limited any extensive development on the lands. A small residential community of approximately 100 homes is located adjacent to Site J just north of Old Edgemoor Lane. There are also residences located to the west and east of the site, although they are located a greater distance from the proposed landfill. Undeveloped forested land occurs south of the site.

The BRF stacks, the dry fly ash stack and the transmission lines leaving the plant site, are the dominant elements in the existing landscape that are visible to motorists on nearby roadways within the foreground and middleground. Undeveloped to sparsely developed land covered in trees comprise the overall viewscape of the area surrounding BRF.

Based on the above characteristics, the scenic attractiveness of the affected environment is considered to be common, whereas the scenic integrity is considered to be low to moderate (Table 3-14).

**Table 3-14. Visual Assessment Ratings for Existing Affected Environment**

| | Existing Landscape | |
|---|---|---|
| **View Distance** | **Scenic Attractiveness** | **Scenic Integrity** |
| Foreground | Common | Low |
| Middleground | Common | Moderate |
| Background | Common | Moderate |
| **Overall Scenic Value Class** | **Fair - Good** | |

The rating for scenic attractiveness is due to the ordinary or common visual quality. The forms, colors and textures in the affected environment are normally seen through the characteristic landscape. Therefore, the landscapes are not considered to have distinctive quality. In the foreground, the scenic integrity has been lowered by human alteration such as BRF and residential and commercial development. However, in the middleground and background these alterations are not substantive enough to dominate the view of the landscape. Based on the criteria used for this analysis, the overall scenic value class for the affected environment is considered to be fair to good.

### 3.18.2 Environmental Consequences

#### 3.18.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, there would be no impacts to the visual environment.

#### 3.18.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

The potential impacts to the visual environment from a given action are assessed by evaluating the potential for changes in the scenic value class ratings based upon landscape scenic attractiveness, integrity and visibility. Sensitivity of viewing points available to the general public, their viewing distances and visibility of the proposed action are also considered during the analysis. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The extent and magnitude of visual changes that could result from the proposed facility were evaluated based on the process and criteria outlined in the scenic management system.

During the construction phase of the proposed facility, there would be additional visual discord due to tree clearing and grading as well as an increase in personnel and equipment in the area. Impacts from additional vehicular traffic are expected to be insignificant as the roads are already used for industrial activity related to BRF operations. This increase in visual discord would be temporary and only last until all activities have been completed by TVA.

Three dimensional visualizations of the proposed landfill from Old Edgemoor Road and the view from the proposed haul road are shown on Figure 2-5 and Figure 2-6. The new landfill would primarily be seen by motorists on the adjacent roadways, Old Edgemoor Lane, and New Henderson Road, SR 170 and the residences along these roads. The tallest feature at the BRF facility are the stacks, approximately 500 ft and 800 ft high. Additionally, the highest point at the existing dry fly ash stack located to the west of Site J is approximately 920 ft msl, which is 100 ft above the natural contours. The proposed landfill would be visible in the foreground and middleground by nearby residents and motorists along local roads. Use of the landfill over estimated lifespan would result in the gradual increase in its height. In time, the proposed landfill would be similar in appearance to the existing dry fly ash stack and be screened to some extent by existing vegetation. Due to the screening effect of the forested terrain to the south, visibility to residents south of the proposed site is expected to be very limited. Additionally, the proposed landfill is not expected to be visible in the background.

The construction of the proposed facility would contrast with the color of the landscape during some phases of operation. The current landscape at the proposed site is predominantly green and brown as a result of the existing vegetation on the site. However, while the CCR in the landfill would contrast with the natural landscape color, it would eventually be covered with an earthen layer and grassy vegetation, just as the existing dry fly ash stack. The dominant shapes in the landscape include the vertical lines of existing transmission structures and stacks of existing facilities against the horizon. The color and shape contrast would be greatest in the foreground to passing motorists and residents, although the contrasts would be less noticeable in the middleground and background.

The 0.5 mi area around the affected environment includes undeveloped forested lands, residences and BRF. Sensitive visual receptors within the foreground of the proposed landfill include residences on the north side of Old Edgemoor Lane and the Valley View Church and Cemetery on the west side of New Henderson Road. The church and cemetery are located between the existing BRF landfill and the proposed Site J location. In the foreground viewing distance, individual details of specific objects are important and easily distinguished. Details are the most significant within the immediate foreground, up to 300 ft. The middleground includes 31 parks, 22 churches and 30 cemeteries. The nearest parks, Brushy Valley Park and Claxton Community Park, are located approximately 0.9 mi east and 0.5 mi west, respectively, of the proposed Site J landfill. In the middleground viewing distance, details are weak as they tend to merge into larger patterns. Visibility of the proposed landfill is expected to be limited to receptors within this viewing distance due to the screening effect of surrounding topography and vegetation. The background includes 361 potentially sensitive visual receptors, including 100 parks, 149 churches and 112 cemeteries. At the background distance, the proposed facility is not expected to be discernible (due to the screening effects of terrain and overall distance) nor would it contrast with the overall landscape.

The existing industrial facilities, transmission lines and dry fly ash stack near the proposed site already contribute minor visual discord with the landscape. These elements also contribute to the landscape's ability to absorb negative visual change. Additionally, the topography and vegetation within the surrounding area provide some screening and allow the landscape to absorb the minor visual changes associated with the proposed landfill at the middleground and background distances (see Figure 2-5 and Figure 2-6).

The proposed facility would contribute to a notable change in visual integrity of the landscape, which would result in a moderate impact to the viewshed of some members of the surrounding community. However, due to the modifications to the landscape from previous development, as well as the presence of the adjacent fossil plant, it is not expected that the existing scenic class would be reduced by two or more levels, which is the threshold of significance of impact to the visual environment. Scenic attractiveness may be reduced to minimal in the foreground but would remain common in the middleground and background. Scenic integrity would remain low to moderate (see Table 3-14). The forms, colors and textures of the landscape that make up the scenic attractiveness would be affected in the foreground but would remain minimal. Impacts to scenic integrity are anticipated to be greatest in the foreground for area residents and other passing motorists along local roads. In the middleground and background, impacts are not considered to be significant as they are not expected to alter the overall landscape. Based on the criteria used for this analysis, the scenic value class for the affected environment after the proposed landfill is constructed is considered to remain at fair to good.

#### 3.18.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill, the Chestnut Ridge Landfill. Since Chestnut Ridge Landfill is an existing, permitted landfill, there would be no changes from the current environment within the landfill boundaries under this alternative. Therefore, potential visual impacts associated with this alternative would primarily be indirect impacts related to the transport of CCR material from BRF to the landfill.

The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill truck and worker vehicle traffic. Therefore, any sensitive visual receptors along the haul route are already subjected to vehicular traffic destined for the landfill, and no new roads would need to be constructed. Transportation of CCR material from BRF to the Chestnut Ridge Landfill could indirectly impact the landscape character along the haul route. However, since landfill traffic currently utilizes this route, any small increase in visual discord as a result of additional trucks would not alter the overall landscape. Therefore, impacts to visual resources along the haul road to the Chestnut Ridge Landfill are not anticipated.

## 3.19 Cultural and Historic Resources

### 3.19.1 Affected Environment

#### 3.19.1.1 Regulatory Framework for Cultural Resources

Cultural resources or historic properties include prehistoric and historic archaeological sites, districts, buildings, structures and objects as well as locations of important historic events. Federal agencies, including TVA, are required by the National Historic Preservation Act (NHPA) (16 USC 470) and by NEPA to consider the possible effects of their undertakings on historic properties. ‘Undertaking’ means any project, activity or program, and any of its elements, which has the potential to have an effect on a historic property and is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency. An agency may fulfill its statutory obligations under NEPA by following the process outlined in the regulations implementing Section 106 of NHPA at 36 CFR Part 800. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act (16 USC 469-469c), Archaeological Resources Protection Act (16 USC 470aa-470mm) and the Native American Graves Protection and Repatriation Act (925 USC 3001-3013).

Section 106 of the NHPA requires that federal agencies consider the potential effects of their actions on historic properties and to 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. This process is carried out in consultation with the State Historic

Preservation Officer (SHPO) and other interested consulting parties, including federally recognized Indian tribes.

Cultural resources are considered historic properties if they are listed or eligible for listing in the National Register of Historic Places (NRHP). The NRHP eligibility of a resource is based on the Secretary of the Interior's criteria for evaluation (36 CFR 60.4), which state that significant cultural resources possess integrity of location, design, setting, materials, workmanship, feeling, association and

a. Are associated with events that have made a significant contribution to the broad patterns of our history, or

b. Are associated with the lives of persons significant in our past, or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or

d. Have yielded, or may yield, information (data) important in prehistory or history.

A project may have effects on a historic property that are not adverse, if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation) that the undertaking's effect on a historic property within the area of potential effect (APE) would diminish any of the qualities that make the property eligible for the NRHP (based on the criteria for evaluation at 36 CFR Part 60.4 above), the effect is said to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site or erecting structures within the viewshed of a historic building in such a way as to diminish the structure's integrity of feeling or setting.

Federal agencies must resolve the adverse effects of their undertakings on historic properties. Resolution may consist of avoidance (such as choosing a project alternative that does not result in adverse effects), minimization (such as redesign to lessen the effects), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Mitigation of adverse effects to historic structures sometimes involves thorough documentation of the structure by compiling historic records, studies and photographs. Agencies are required to consult with SHPOs, tribes and others throughout the Section 106 process and to document adverse effects to historic properties resulting from agency undertakings.

#### 3.19.1.2 Area of Potential Effect

The APE is the 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.

Under Alternative A – No Action Alternative, TVA would continue to manage CCR in its existing permitted dry fly ash stack. Therefore, the APE for Alternative A is the footprint of the stack and is expected to consist of previously developed and disturbed lands.

For Alternative B, TVA defined the APE to address both archaeological resources (below ground) and for historic architectural resources (above ground). The APE is defined as the project footprint, Site J, as this is the area within which ground disturbance may occur during construction and operation of the landfill as well as the area where direct and indirect effects could occur to historic architectural resources.

For Alternative C, the APE would consist of the existing off-site landfill and the existing transportation corridors (public roads) between BRF and the landfill. The off-site landfill occurs on previously developed and disturbed lands. In addition, the permitted landfill would have previously undergone the Section 106 review process to evaluate impacts to historic properties when it was constructed. CCR material from BRF would be transported to the landfill along existing transportation corridors which had previously been disturbed during their construction.

#### 3.19.1.3 Previous Studies

TVA has conducted records searches at the Tennessee Division of Archaeology and the Tennessee Historical Commission, located in Nashville, Tennessee, to identify previously recorded archaeological and architectural properties listed on, or eligible for inclusion in the NRHP within the APE. No historic architectural resources have been recorded within the plant boundary. The powerhouse and other plant facilities are less than 50 years in age. The integrity of the original powerhouse and stack has been negatively impacted by recent construction, including the installation of the FGD system and associated stack. Therefore, TVA has determined that the plant is not a historic property.

To date, TVA has conducted three investigations, including both archaeological and architectural surveys under Section 106 of the NHPA within the APE. The archeological surveys field inspections involved systematic shovel testing at 100-ft intervals and a visual examination of exposed ground surfaces and any terrain with a slope greater than 20 percent. No new archaeological sites were recorded as a result of these investigations (TRC 2011, TRC 2012 and TRC 2013). The SHPO concurred with TVA's finding of no historic properties affected (Appendix D).

TVA conducted an architectural survey of the APE in 2012 as part of the purchase of Site J and demolition of vacant structures on the property. This survey identified 12 previously unrecorded architectural resources that were over 50 years old. Evaluations of these resources determined that they were not eligible for the NRHP because of their lack of architectural distinction; loss of integrity caused by modern alterations and/or damage; and the inability to associate the houses and/or their original owners with an important historical event or series of events (TRC 2011 and TRC 2012). SHPO concurred with TVA's finding of no historic properties affected (see Appendix D).

### 3.19.2 Environmental Consequences

#### 3.19.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct a CCR landfill on-site or transport CCR to an off-site landfill. TVA would continue to manage CCR in its existing dry fly ash stack. Implementing Alternative A would require no new ground disturbance activities. Therefore, no direct or indirect impacts to cultural resources would occur under Alternative A.

#### 3.19.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under Alternative B, no impacts to cultural resources are anticipated as no archaeological sites or architectural resources eligible for listing in the NRHP were identified within the APE from either a record search or survey. Topography and vegetation limit the extent of the APE and provide screening to structures outside the APE. In letters dated December 8, 2011, January 3, 2012, November 6, 2012, December 12, 2012, and May 17, 2013, the SHPO concurred with the determination that no effect on cultural resources would occur for projects occurring with the APE (see Appendix D). Therefore, construction of the landfill is not expected to have an adverse impact on cultural resources.

The eastern portion of the proposed haul road overlaps with areas previously surveyed. The remaining portions of the proposed haul road APE were not previously surveyed. Given the degree of ground disturbance that has taken place within the proposed haul road during the construction and maintenance of the rail line and previous projects related to the construction and use of BRF, TVA finds that this portion of the archaeological APE has no potential for the presence of intact archaeological sites. Therefore, construction of the haul road is not expected to have an impact on cultural resources.

A soil borrow stockpile will occur within the project limits and will have no effect on cultural resources. If additional borrow material is needed from outside the project area, borrow material will be obtained from a permitted location where the potential for impact to cultural resources had been considered.

In summary, TVA has determined that there are no archaeological or architectural resources within the APE for Alternative B. If an unidentified archaeological site is discovered during construction, TVA will cease all construction activities in the immediate area where archaeological material is discovered. TVA will contact the SHPO to determine what further action, if any, will be necessary to comply with Section 106 of the NHPA.

#### 3.19.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under Alternative C, no direct impacts to historic properties would occur. Chestnut Ridge Landfill is a permitted landfill that has previously undergone the Section 106 review process to evaluate impacts to historic properties. As part of the landfill permitting process, the Tennessee State Archaeologist also reviews the site for the existence of burial grounds. No historic properties have been identified at the Chestnut Ridge (TVA 2010). Therefore, the addition of CCR material from BRF to this landfill would not result in any direct impacts to historic resources.

Indirect impacts from transporting CCR to the Chestnut Ridge Landfill could include an increase in vibrations and noise to historic resources located adjacent to the haul route. The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Therefore, any historic resources along the haul route are already subjected to vehicular traffic destined for the landfill. Any increase in indirect impacts due to increased truck traffic would be intermittent and not expected to impair or adversely affect historic resources. Based on a record search, no historic resources listed on the NRHP were identified along the proposed CCR haul route.

## 3.20 Noise

### 3.20.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities and diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses and the time of day the noise occurs (i.e., higher sensitivities would be expected during the quieter overnight periods).

Sound is measured in units of decibels (dB) on a logarithmic scale. The “pitch” (high or low) of the sound is a description of frequency, which is measured in Hertz (Hz). Most common environmental sounds are a composite of sound energy at various frequencies. A normal human ear can usually detect sounds that fall within the frequencies from 20 Hz to 20,000 Hz. However, humans are most sensitive to frequencies between 500 Hz to 4,000 Hz.

Given that the human ear cannot perceive all pitches or frequencies in the sound range, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel or the A-weighted decibel (dBA). A-scale weighting reflects the fact that a human ear hears poorly in the lower octave-bands. It emphasizes the noise levels in the higher frequency bands are heard more efficiently by the ear and discounts the lower frequency bands. A noise change of 3 dBA or less is not normally detectable by the average human ear. An increase of 5 dBA is generally readily noticeable by anyone, and a 10 dBA increase is usually felt to be "twice as loud" as before.

Common indoor and outdoor noise levels are listed in Table 3-15.

#### 3.20.1.1 Noise Regulations

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level, or Leq. The Leq value, expressed in dBA, is the energy-averaged, A-weighted sound level for the time period of interest. The day-night sound level (Ldn), is the 24-hour equivalent sound level, which incorporates a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m., to account for the increased annoyance during this period and the fact that most people are more sensitive to noise while they are trying to sleep. EPA (1974) guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985). These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (EPA 1974). In Anderson County, allowable noise levels vary depending on the zoning district. Residential (R-1) districts have the most stringent regulations and cannot exceed 60 dBA during the daytime hours or 55 dBA during the night, measured at the closest adjacent property line. In addition, allowable noise levels from industrial properties cannot exceed 80 dBA.

#### 3.20.1.1 Background Noise Levels

Noise levels continuously vary with location and time. In general, noise levels are high around major transportation corridors along highways, railways, airports, industrial facilities and construction activities. Sound from a source spreads out as it travels from the source, and the sound pressure level diminishes with distance. In addition to distance attenuation, the air absorbs sound energy; atmospheric effects (wind, temperature, precipitation) and terrain/vegetation effects also influence sound propagation and attenuation over distance from the source. An individual’s sound exposure is determined by measurement of the noise that the individual experiences over a specified time interval.

**Table 3-15. Common Indoor and Outdoor Noise Levels**

| Common Outdoor Noises | Sound Pressure Levels (dB) | Common Indoor Noises |
|---|---|---|
| | 110 | Rock Band at 5 m (16.4 ft) |
| Jet Flyover at 300 m (984.3 ft) | | |
| | 100 | |
| | | Inside Subway Train (New York) |
| Gas Lawn Mower at 1 m (3.3 ft) | | |
| | 90 | |
| | | Food Blender at 1 m (3.3 ft) |
| Diesel Truck at 15 m (49.2 ft) | | Garbage Disposal at 1 m (3.3 ft) |
| | 80 | |
| | | Shouting at 1 m (3.3 ft) |
| Gas Lawn Mower at 30 m (98.4 ft) | 70 | Vacuum Cleaner at 3 m (9.8 ft) |
| Commercial Area | | Normal Speech at 1 m (3.3 ft) |
| | 60 | |
| | | Large Business Office |
| | 50 | Dishwasher Next Room |
| Quiet Urban Daytime | | |
| | 40 | Small Theater, Large Conference Room |
| Quiet Urban Nighttime | | Library |
| Quiet Suburban Nighttime | | |
| | 30 | |
| | | Bedroom at Night |
| Quiet Rural Nighttime | | Concert Hall (Background) |
| | 20 | |
| | | Broadcast and Recording Studio |
| | 10 | |
| | | Threshold of Hearing |
| | 0 | |

Source: Arizona DOT 2008.

Community noise refers to outdoor noise near a community. A continuous source of noise is rare for long periods and is typically not a characteristic of community noise. Typical background day/night noise levels for rural areas range between 35 and 50 dBA whereas higher-density residential and urban areas background noise levels range from 43 dBA to 72 dBA (EPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio and sleeping.

#### 3.20.1.2 Sources of Noise

BRF is bordered by forested ridges on the north and south, a partially forested valley to the east and the Clinch River on the west. There are noise sensitive land uses (i.e., residential areas) located north, south and east of the plant site. The partially forested hills across the river are used for residential and recreational purposes. The residences closest to the plant and therefore most affected by plant noise, are located north of the plant.

There are numerous existing sources of noise at BRF. Operations at the existing coal plant generate varying amounts of environmental noise. Noise generating activities associated with the existing plant include coal unloading activities, periodic dozer operations associated with coal pile management and truck operations. Existing noise emission levels associated with these activities typically range from 59 to 87 dBA (TVA 2014).

Noise sources common to activities evaluated in this EIS include noise from industrial activities, transportation noise and construction noise. Transportation noise related to activities evaluated in the EIS primarily includes noise from highway traffic; however, there would also be some noise related to rail traffic at BRF. Three primary factors influence highway noise generation; traffic volume, traffic speed and vehicle type. Generally, heavier traffic volumes, higher speeds and greater numbers of trucks increase the loudness of highway traffic noise. Other factors that affect the loudness of traffic noise include a change in engine speed and power, such as at traffic lights, hills and intersecting roads and pavement type. Highway traffic noise is not usually a serious problem for people who live more than 500 ft from heavily traveled freeways or more than 100 to 200 ft from lightly traveled roads (FHWA 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic typically results in a 3 dBA increase in noise levels. Railway noise depends primarily on the speed of the train but variations are present depending upon the type of engine, wagons and rails (Berglund and Lindvall 1995). At BRF however, rail operations are conducted at very low speeds and likely result in lower noise emissions.

The level of construction noise is dependent upon the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels as a result of the operation of construction equipment on-site and the movement of construction-related vehicles (i.e., worker trips and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles.

### 3.20.2 Environmental Consequences

#### 3.20.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not seek additional disposal options for placement of CCR generated at BRF. Rather, CCR would continue to be stored in the current dry fly ash stack for as long as storage capacity is available. No changes in the existing noise environment would occur under this alternative. In the long term however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, noise from plant operations would be reduced within the immediate region. However, because any impact to operations at BRF would not be consistent with TVA's long range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

### 3.20.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this Alternative, TVA would construct and operate a landfill for dry disposal of CCR on TVA-owned property located approximately 0.4 mi east of BRF. Development of Site J would also include construction of a dedicated on-site haul road to convey CCR from the plant to the landfill.

#### 3.20.2.2.1 Construction Noise

Most construction activities would occur during the day on weekdays; however, construction activities could occur at night or on weekends, if necessary. Construction-related noise would result from the construction of the new bridge over New Henderson Road. Some construction-related traffic would likely use SR 170, New Henderson Road and Old Edgemoor Lane to access the construction site. This would result in some temporary construction traffic noise on these roadways. Construction of the landfill and the relocation of Worthington Branch would likely require rock excavation with controlled blasting due to the topographic relief and shallow bedrock at the site.

Such activities would result in elevated temporary short-term noise levels. The blasting would be at the initial phase of landfill construction only and would be controlled at certain times during the day. Construction activities would generate noise from compactors, front loaders, backhoes, graders, trucks and blast devices. As illustrated in Table 3-16, typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 ft from the construction site. These noise levels would diminish with distance from the project site at a rate of approximately 6 dBA per each doubling of distance. Therefore, noise would be expected to attenuate to the recommended HUD noise guideline of 65 dBA at approximately 500 ft. However, this distance would be shorter in the field as objects and topography would cause further noise attenuation. Although construction noise would attenuate to meet the HUD guideline of 65 dBA during daytime hours, construction noise could still remain above the EPA guideline of 55 dBA. However, these impacts would be intermittent and temporary. Given the temporary and intermittent nature of construction noise, the impact of noise generated from construction activities is expected to be minor.

**Table 3-16. Typical Construction Equipment Noise Levels**

| Equipment | Noise Level (dBA) at 50 ft |
|---|---|
| Dump Truck | 84 |
| Bulldozer | 85 |
| Scraper | 85 |
| Grader | 85 |
| Excavator | 85 |
| Compactor | 80 |
| Concrete Truck | 85 |
| Boring-Jack Power Unit | 80 |
| Backhoe (trench) | 80 |
| Flatbed Truck | 84 |
| Crane (mobile) | 85 |
| Generator | 82 |
| Air Compressor | 80 |
| Pneumatic Tools | 85 |
| Welder/Torch | 73 |

#### 3.20.2.2.2 Operation Noise

Primarily, operation of the proposed landfill would occur during the day on weekdays. The transition from construction-period noise to operation-period noise at Site J would be relatively indistinct since the same type of equipment would be used to operate the landfill as would be used during construction of the landfill. The construction of the dedicated on-site haul road would be temporary; however, the movement of dump trucks carrying CCR over the haul road would fall into operation of the landfill and would not be temporary. To assess the impact of noise from landfill operations, several potential noise receptors were identified near the proposed site and analyzed for noise impacts. Noise level impacts from construction equipment used to operate the landfill and along the dedicated on-site haul road are listed in Table 3-17.

**Table 3-17. Predicted Noise Levels Resulting from Operations at Site J**

| Noise Generation Feature | Noise Level (dBA) at 50 ft | Receptor | Distance to Receptor (ft) | Noise Level (dBA) at Receptor |
|---|---|---|---|---|
| Dozer, Scraper, Grader or Excavator | 85 | Residence on Old Edgemoor Lane east of New Henderson | 507 | 64.9 |
| | | Residence on Greendale Lane | 541 | 64.39 |
| | | Church of Christ on Old Edgemoor Lane | 602 | 63.4 |
| Articulated Dump Truck | 84 | Valley View Church located on Old Edgemoor west of New Henderson | 500 | 64.0 |

Noise levels attenuate to below 65 dBA at the receptor located nearest to the proposed landfill site. The nearest receptor to the landfill boundary is a residence on Old Edgemoor Lane east of New Henderson Road (507 ft from the proposed landfill). Based on straight line noise attenuation, it is estimated that noise levels from landfill operations would attenuate to approximately 64.9 dBA. This would occur on weekdays during normal daytime working hours. The nearest receptor to the proposed haul road is the Valley View Church on Old Edgemoor Lane west of New Henderson Road (500 ft from the haul road). Based on straight line noise attenuation, it is estimated that noise levels from hauling operations on the haul road would attenuate to approximately 64 dBA. Noise from the operations of the landfill would attenuate to meet the HUD guideline of 65 dBA during daytime hours. Operational noise could still remain above the EPA guideline of 55 dBA. However, operational noise impacts would be intermittent and only occur during normal working hours. Consequently, noise impacts associated with the operation of the landfill at Site J are expected to be minor and are not expected to cause adverse effects.

### 3.20.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge Landfill)

CCR from BRF would be transported off-site to an existing permitted landfill, therefore, noise impacts under this alternative would be related to the noise associated with the transport of CCR from BRF to this facility. The Chestnut Ridge Landfill is located approximately 12 mi northeast of BRF. The probable haul route uses rural arterial roadways Edgemoor Road and Raccoon Valley Road (both of which represent SR 170) and Fleenor

Mill Road. Current traffic on these roadways includes truck use. Sensitive noise receptors such as churches and residences located along the haul route proximate to these roadways would be impacted by the noise generated by the transport of CCR.

To determine potential impacts of traffic-related noise, FHWA's Traffic Noise Model was used to predict noise impacts to selected receptors located closest to the haul road. These impacts are used to represent the bounding condition. Based on anticipated generating rates, it is estimated that 100 truckloads would be needed to transport CCR to the Chestnut Ridge Landfill per day for a typical five-day work week. This would result in traffic count of 200 trips per day along the haul route or approximately 23 truck trips per hour over a typical nine-hour workday throughout the life of the landfill (estimated at approximately 15.5 years).

Predicted peak noise levels were modeled within four separate sections of the haul route to the Chestnut Ridge Landfill. These sections were delineated based on locations where the existing traffic flow exhibits a noticeable change in volume. The sections are: (1) SR 170 (Edgemoor Road) from BRF to US 25W; (2) SR 170 (Raccoon Valley Road) from US 25W to Heiskell Road; (3) SR 170 (Raccoon Valley Road) from Heiskell Road to Fleenor Mill Road; and (4) Fleenor Mill Road from SR 170 (Raccoon Valley Road) to Chestnut Ridge Landfill.

Noise levels were modelled at 18 receptors identified along the haul route. These receptors were used to represent noise levels within the area bounded by 360 ft north of the haul route and 250 ft south of the haul route, distances that were established based on the extent of potential noise impacts. The peak modeled noise levels within each of the four sections is shown below in Table 3-18.

Existing noise levels along the haul route range from a low of 53.8 dBA to 66.3 dBA given existing traffic volumes and from a low of 56.1 dBA to 66.8 dBA given predicted traffic volumes resulting from the transport of CCR from BRF. Noise levels are generally higher along SR 170 (Edgemoor Road) than along the other sections of the haul route due to the heavier traffic volume on SR 170 (Edgemoor Road).

**Table 3-18. Predicted Noise Levels Along the Haul Route from BRF to the Chestnut Ridge Landfill**

| Roadway Noise Analysis by Section | Estimated Modeled Noise Level (dBA) |
|---|---|
| **Along Edgemoor Road** | |
| Existing Peak | 66.3 |
| Peak during hauling | 66.8 |
| **Along Raccoon Valley Road - west of Heiskell** | |
| Existing Peak | 59.5 |
| Peak during hauling | 61.4 |
| **Along Raccoon Valley Road - east of Heiskell** | |
| Existing Peak | 57.9 |
| Peak during hauling | 60.1 |
| **Along Fleenor Mill Road** | |
| Existing Peak | 53.8 |
| Peak during hauling | 56.1 |

Based on FHWA thresholds for noise impacts, there are no impacted receptors along the haul route. FHWA has determined that if the predicted noise level at a receptor is 67 dBA or greater, then it would be considered an impacted receptor. Also, FHWA has determined that if a receptor experiences a noise level increase of 10 dBA or more, it is considered to be an impacted receptor. Tennessee Department of Transportation also uses the substantial criterion of 10 to 15 dBA to define a noise impact (TDOT 2011).

However, there are 23 receptors along the haul route that may experience an increase in noise level of 3 dBA or more, which is the threshold that is audibly detectable by the human ear. This increase occurs along SR 170 (Raccoon Valley Road) between Heiskell and I-75 where existing noise levels are relatively low and the increase in truck traffic would result in a noise level increase of over 3 dBA (but not more than 4 dBA).

Except for the area noted above, the noise impact associated with hauling of CCR from BRF to the Chestnut Ridge Landfill is expected to be minor. Those areas along the haul road where existing noise levels are relatively low, an increase more than 3 dBA would potentially create a higher impact relative to existing conditions. Therefore, given the duration of trucking (up to 15.5 years) and the change in noise levels (between 3 and 4 dBA) across the haul route, implementation of this alternative is expected to have a moderate noise impact.

## 3.21 Public Health and Safety

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. OSHA is the main statute protecting the health and safety of workers in the workplaces. OSHA regulations are presented in Title 29 CFR Part 1910 (29 CFR 1919), OSHA. A related statute, 29 CFR 1926, contains health and safety regulations specific to the construction industry. The Tennessee Department of Labor and Workforce Development has adopted federal OSHA standards contained in 29 CFR Parts 1910 and 1926 pursuant to Tennessee Code Annotated (TCA) Section 50-3-201.

### 3.21.1 Affected Environment

The routine operations and maintenance activities at the existing BRF reflect a safety-conscious culture and are activities performed consistent with OSHA and TCA standards and requirements and specific TVA guidance. Personnel at BRF are conscientious about health and safety having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training and control measures. This culture of emphasizing health and safety is reflected in the BRF's safety record which shows over the past three years only two OSHA Recordable Cases and zero Lost Time Cases reported.

The BRF has safety programs and BMPs in place to minimize the potential of safety incidences. These would include but are not limited to such programs as the following:

- Hazard Analysis
- Management of Change
- Spill and Emergency Response Plan
- Standard Operating Procedures
- Safety Reviews

- Compliance Audits
- Training
- Incident Investigations

It is TVA's policy that contractors have a site-specific health and safety plan in place prior to conducting construction activities at TVA properties. The contractor site-specific health and safety plans address the hazards and controls as well as contractor coordination for various construction tasks. A health and safety plan would also be required for workers responsible for operations after construction is complete.

The potential off-site consequences and emergency response plan are discussed with local emergency management agencies. These programs are audited by TVA no less than once every three years and by EPA periodically.

Health hazards are also associated with emissions and discharges from the facility as well as accidental spills/releases at the plant and/or along the pipelines. Mitigative measures are used to ensure protection of human health which includes the workplace, public and the environment. Applicable regulations and attending administrative codes that prescribe monitoring requirements may include those associated with emergency management, environmental health, drinking water, water and sewage, pollution discharge, air pollution, hazardous waste management and remedial action.

Additionally, wastes generated by operation of the plant can pose a health hazard. Wastes including solid wastes, hazardous waste, liquid wastes, discharges and air emissions are managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Furthermore, waste reduction practices are employed including recycling and waste minimization. TVA is committed to complying with all applicable regulations, permitting and monitoring requirements.

### 3.21.2 Environmental Consequences

#### 3.21.2.1 Alternative A – No Action

The operations and maintenance activities at the existing BRF will continue within the safety-conscious culture and activities currently performed in accordance with applicable standards or specific TVA guidance. BRF will continue to address and manage reduction or elimination of occupational hazards through implementation of safety practices, training and control measures. BRF's safety conscious efforts will continue such that impacts on worker and public health and safety would be maintained and minimal.

#### 3.21.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Construction activities in support of the proposed landfill and on-site haul road would be performed consistent with standards as established by OSHA and TCA requirements.

Construction and operation of the proposed landfill and its associated haul road would require the use of earthmoving, compacting and paving equipment as well as trucks for hauling materials. Additionally, some controlled blasting would be required to create the new bypass channel for Worthington Branch.

TVA would develop a detailed blasting plan to protect workers and neighboring properties prior to any blasting activities. The plan would identify the specifications or rules that clearly define the performance and safety requirements of the work. The plan would also delineate proper hearing protection for workers in the vicinity of the blast and would ensure that the use, transportation and storage of explosives is being conducted in accordance with all applicable or relevant regulations, including 29 CFR 1926.900, Blasting and the Use of Explosives; 49 CFR Parts 171-179, Highways and Railways and 49 CFR Parts 390-397 Motor Carriers (transportation); and 27 CFR Part 55, Commerce in Explosives (storage).

All possible care would be exercised in the construction blasting operations to prevent excess ground vibrations and air overpressures and limit flyrock to the blasting area as defined by the Mining Safety and Health Administration. Various controlled techniques would include the following:

- Ensure that only blasters or contractors with appropriate experience are allowed to perform the work.
- Purchase explosives in the minimum amount required, with any excess explosives returned to the vendor.
- Ensure that site explosive storage areas at applicable safe distances from personnel or structures.
- Ensure that explosives storage areas/buildings are accessible only to authorized personnel.
- Secure blasting areas and notify workers and nearby residents before a blasting activity occurs.
- Ensure careful placement of measured explosive quantities in blast holes.
- Limit explosives quantities per time delay, starting with the smallest quantities of explosives possible and scaling up to production-size blasts.
- Initiate blasting time delays to mitigate ground vibrations toward the closest structures or facility.

Implementation of the elements stated above would ensure that proposed blasting activities would not result in significant impacts and uphold worker and public health and safety.

During the remaining landfill and roadway construction, customary industrial safety standards as well as the establishment of appropriate BMPs and job site safety plans would describe how job safety will be maintained during the project. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping and personal protective equipment are in place; the establishment of programs and procedures for lockout, right-to-know, confined space, hearing conservation, forklift operations, excavations, grading and other activities; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazards.

The operation of the proposed landfill would adhere to TVA guidance and be consistent with standards established by OSHA and TCA requirements. The proposed landfill would establish health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards through implementation of safety practices, training and control measures. All wastes would be managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Implementation of operational safety measures would manage and address monitoring and control; maintenance and integrity programs; performance of field surveys and inspections; right-of-way maintenance; and public awareness. Therefore, worker and public health and safety during operation would be maintained and impacts would be minor.

#### 3.21.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this Alternative, dry CCRs generated at BRF would be transported by truck on existing roadways to the Chestnut Ridge Landfill for disposal. Alternative C would increase the traffic on existing roadways which would potentially increase the risk of injuries and fatalities associated with truck crashes.

Implementation of Alternative C may require fleet expansion. A larger fleet would increase the number of vehicles and drivers as well as additional traffic on present roadways. The BRF fleet would establish health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards through implementation of safe operation practices, training and control measures.

All wastes generated by the fleet would be managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Implementation of operational safety measures would manage and address monitoring and control; maintenance and integrity programs; performance of field surveys and inspections; right-of-way maintenance; and public awareness.  Worker and public health and safety during operation would be maintained and impacts would be minor.

Conversely, TVA may decide to contract transportation services. TVA policy requires that contractors have in place a site-specific health and safety plan prior to operation on TVA properties. The contractor site-specific health and safety plan addresses the hazards and controls; spill and emergency response; as well as contractor coordination for operations. Similarly, all these measures should maintain site worker and public health and safety and the impacts would be minor.

## 3.22 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPS are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with the management of CCR from BRF have the potential to cause unavoidable adverse effects to several environmental resources.

Under Alternative B, construction of a new landfill up to 119.9 ac of undeveloped land at Site J and 14.8 ac of undeveloped land that would be used for the onsite haul road would be converted to industrial use. However, the project area is located within the boundaries of an existing industrial use (i.e., BRF). Additionally, the relocation of Worthington Branch would have short-term, unavoidable impacts to aquatic resources. Clearing and grading of the site would result in long-term impacts to species composition and wildlife habitat. However, this impact is minor relative to the abundance of similar cover types within the vicinity.

Other impacts associated with Alternative B would primarily be related to impacts that occur during construction activities. Activities associated with the use of construction equipment may result in varying amounts of dust, air emissions, noise and vibration that may potentially impact both on-site workers and off-site residents near the landfill site. Potential noise impacts also include traffic noise associated with the construction workforce traveling to and from the site. Emissions from construction activities and equipment are minimized through implementation of mitigation measures, including proper maintenance of construction equipment and vehicles.

Unavoidable temporary impacts to water quality from runoff at the site could impact nearby outfalls and water bodies during initial construction of the landfill. BMPs to minimize runoff would be implemented, but there could still be some uncontrolled runoff that could affect nearby outfalls and water bodies.

Under Alternative C, the transport of CCR material from BRF to the disposal site would increase truck traffic volumes on public roads which could compromise driver safety. This additional operations-related traffic would also increase noise and fugitive dust in areas proximate to these roads. Emissions from the haul trucks are minimized through implementation of BMPS including proper vehicle maintenance.

## 3.23 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EIS focuses on the analyses of environmental impacts associated with the daily generation of CCR at BRF and the method of disposing of the CCR over the next 20 years. These activities are considered short-term uses for purposes of this section. The long-term is considered to be initiated with the cessation of operations at the landfill. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project site.

Short-term uses of the environment generally are those associated with construction, including labor and construction materials. For this project, construction activities are associated with the initial development of the proposed landfill at Site J (Alternative B), which would involve:

- Constructing the on-site haul road between BRF and Site J.
- Relocating Worthington Branch (a stream).
- Relocating transmission lines and utilities.
- Clearing and grading of the land to make way for the landfill.
- Placing the landfill composite liner system.

The acreage disturbed during the initial clearing for the proposed landfill site will have a negative effect on a limited amount of short-term uses of the environment such as air, noise, soil and water resources (relocation of Worthington Branch). Additionally, these construction activities may displace some wildlife, aquatic resources and alter existing vegetation. Since the proposed actions would occur within an area previously subject to human disturbance and the surrounding vicinity includes similar vegetation and habitat types, the short-term disturbance due to construction and operations is not expected to significantly alter long-term productivity of wildlife or other natural resources.

In addition to the initial construction activities, the day-to-day operation of BRF, the daily disposal of CCR and the daily operation of the landfill at Site J are also considered to be short-term uses of the environment.

Construction and operation of the landfill would have a favorable short-term impact to the local economy through the creation of construction and support jobs and revenue. Additionally, since there is limited capacity for additional CCR disposal on-site, at some point in the future, capacity to store CCR on-site will become a limiting factor for BRF operations. Therefore, the development of the landfill at Site J would have a favorable short-term impact on the operations at BRF in that the proposed landfill would meet the need for long-term storage of CCR generated at BRF.

Long-term effects would include the permanent loss of terrestrial wildlife habitat within the landfill construction area and a permanently altered stream course for Worthington Branch. However, effects due to the relocation of the stream are expected to be minimized in the long-term as aquatic species repopulate in the new channel. Additionally, other high quality forested habitat for displaced wildlife is located elsewhere in the vicinity of the project area. In addition, the formation and growth of the landfill over time will gradually alter the viewshed around the landfill. Once the landfill ceases operation, there would also be limitations on future use of this land. However, as the proposed landfill is located on property developed for industrial use, any future land use would be limited to those uses that are compatible with industrial uses.

If needed, the purchase of borrow material will have a short-term impact on the availability of this resource for other uses, however this impact is minimized as borrow material would primarily be obtained from the project site.

Use of the Chestnut Ridge Landfill would impact capacity and, therefore, have an impact on the users of the landfill. However, there are other landfills within the region that may be utilized for disposal of other waste materials.

The development of the landfill at Site J would have a favorable long-term impact on the operations at BRF in that the proposed landfill offers TVA approximately 15 more years of disposal capacity. Since there is limited capacity for additional CCR disposal on-site, at some point in the future, capacity to store CCR on-site will become a limiting factor for BRF operations. The proposed landfill at Site J will also be developed to meet the requirements of a Class II Solid Waste Facility as specified by TDEC Division of Solid Waste Management and Federal Subtitle D requirements for dry CCR disposal.

## 3.24 Irreversible and Irretrievable Commitments of Resources

This section describes the expected irreversible and irretrievable environmental resource commitments used in the new landfill construction and operation. The term irreversible commitments of resources describes environmental resources that are potentially changed by the new facility construction or operation that could not be restored at some later time to the resource's state prior to construction or operation. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road right of way as long as the road remains. Irretrievable commitments of resources are generally materials that are used for the new facility in such a way that they could not, by practical means, be recycled or restored for other uses. For example, mining of ore is an irretrievable commitment of a resource; once the ore is removed and used, it cannot be restored.

The land used for the proposed landfill at Site J is irreversibly committed because the land would be permanently converted from an undeveloped use to a landfill that will remain for the life of the landfill. The materials used for the construction of the proposed landfill would be committed for the life of the landfill. All building materials associated with the construction of the haul road and landfill would be irrevocably committed.

Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction and transport of CCR to the landfill. In addition, construction materials (such as liners) would be consumed. However, their limited use in this project would not adversely affect the future availability of these resources generally.

The Chestnut Ridge Landfill is an existing landfill, and there would be no changes to the committed materials and resources associated with construction. However, nonrenewable fossil fuels would be irretrievably lost through the use of fuel by trucks used to transport CCR to this landfill. Due to the higher number of trucks needed and the greater number of miles travelled, this impact would be greater than that described for Alternative B, but would still be minor relative to existing supplies.

Any use of off-site borrow material during landfill operations (either at the proposed landfill at Site J or at the Chestnut Ridge Landfill) would be both an irreversible and irretrievable commitment of resources. However, given the limited use of this resource required for this action, the impact would affect the future availability of the resource.

## 3.25 Cumulative Effects

This section supplements preceding analyses that include in some degree the potential for cumulative adverse impacts to the region’s environment that could result from construction and operation of the proposed landfill and haul road. The CEQ regulations (40 CFR §§ 1500-1508) implementing the procedural provisions of the NEPA of 1969, as amended (42 USC § 4321 et seq.) define cumulative impact as: “…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) or person undertakes such other actions” (40 CFR § 1508.7).

A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of the project when added to other past, present and reasonably foreseeable future actions (40 CFR 1508.7). Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions and either explicitly or implicitly considered cumulative impacts.

### 3.25.1 Scoping for Cumulative Effects Analysis

#### 3.25.1.1 Identification of the Significant Cumulative Effects Issues

TVA evaluated a full range of environmental resource issues for inclusion in the cumulative effects analysis. The proposed action and its connected actions identified under Alternative B would occur on land that was previously cleared and developed for residential properties. The surrounding landscape is already subject to environmental stressors associated with continuing industrial operations and previous disturbance of the site. Consequently, as has been described in prior subsections of this EIS, the existing quality of environmental resources potentially directly or indirectly affected by project activities is generally low. The proposed action identified under Alternative C would occur on land developed as a landfill and would utilize existing roadways for transport of CCR, accordingly impacts associated with this alternative are confined to those associated with the transport of CCR from BRF to the proposed Site J landfill.

This analysis is limited only to those resource issues potentially adversely affected by project activities or connected actions. Accordingly, climate change, land use, prime farmland, wildlife, groundwater, geology/soils, surface water, floodplain, natural areas, parks/recreation, cultural and historic resources, hazardous materials/waste, socio-economics and safety are not included in this analysis as these resources are either not adversely affected, or the effects are considered to be adverse and minor, or beneficial. Primary resource categories specifically considered in this cumulative effects assessment include air quality, wetlands/aquatic ecosystems, terrestrial ecology, threatened and endangered species, transportation, visual effects, noise and environmental justice.

#### 3.25.1.2 Geographic Area of Analysis

The appropriate geographic area over which past, present and future actions could reasonably contribute to cumulative effects is variable and dependent on the resource evaluated. Based upon the defined list of resources potentially affected by cumulative effects, two general geographic areas were considered appropriate for consideration in this analysis.

- *Lands within Anderson County in the Vicinity of the Proposed Landfill and Haul Road*. This geographic area provides an appropriate framework for the consideration of potential cumulative effects to vegetation and wildlife resources, including threatened and endangered species. This geographic area includes near off site areas and the 10-mi radius within Anderson County and encompasses lands on the proposed landfill site, near off-site areas proposed for use as laydown during construction and the proposed access road and haul roads to the off-site landfill. For visual effects, noise and environmental justice, the cumulative impacts analysis will be on near off-site areas.
- *Waters and Wetlands within Worthington Branch and Surrounding Tributaries*. This geographic area contains surface water resources potentially receiving runoff from the proposed landfill operation and wetland/aquatic resources modified by proposed construction of the landfill and access road. Wetland complexes and aquatic ecosystems are hydrologically and physically contiguous with similar resources potentially affected by the proposed project.

#### 3.25.1.3 Identification of “Other Actions”

Past, present and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-19. These actions were identified within the geographic area of analysis as having the potential to, in aggregate, result in larger and potentially significant adverse impacts to the resources of concern.

**Table 3-19. Summary of Other Past, Present or Reasonable Foreseeable Future Actions in the Vicinity of the Proposed Project**

| Actions Description | Description | Timing and Reasonable Foreseeability |
|---|---|---|
| Mechanical Dewatering Facility | Installation of mechanical dewatering facility for dry storage of ash and gypsum at BRF | Past |
| House Demolition | 166 ac purchase adjacent to BRF to expand plant boundary | Past |
| BRF Ash Impoundment Closure | Closure of ash impoundments at BRF facility | Reasonably Foreseeable Future |

Actions that are listed as having a timing that is "past" or "present" inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. However, these actions are included in this discussion to provide for a more complete description of their characteristics. Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis.

#### 3.25.1.3.1 Mechanical Dewatering Facility

TVA recently installed equipment to remove water from gypsum and bottom ash generated at BRF (TVA 2012). The equipment is located in a pre-engineered building located southwest of the powerhouse. Installation of the mechanical dewatering facility has allowed TVA to close wet CCR handling and disposal operations at BRF. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

#### 3.25.1.3.2 House Demolition

TVA purchased approximately 166 ac adjacent to BRF to expand the plant boundary (TVA 2013). Several of the homes and structures were removed by previous owners of the property before TVA took ownership; however, some vacant structures remained, including dwellings, garages and out-buildings. To minimize the risk to human health and safety, TVA decided to demolish and remove the remaining structures. This site is includes the area currently under consideration by TVA as the potential site for a new CCR landfill. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

#### 3.25.1.3.3 BRF Ash Impoundment Closure

TVA has evaluated alternatives to close ash impoundments at BRF under the CCR Rule (TVA 2016). The preferred closure method evaluated in the ash impoundment EIS is closure-in-place, which would involve dewatering, grading and reconfiguring the CCR and installing an approved cover system with a protective soil cover. In addition, a groundwater monitoring system would be installed and operated per state requirements. Ash impoundments are BRF are expected to be closed within a five-year period.

### 3.25.1.4 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the project area was considered in conjunction with the environmental impacts presented in Chapter 3. These combined impacts are defined by the CEQ as "cumulative" in 40 CFR Regulations 1508.7 and may include individually minor, but collectively significant actions taking place over a period of time. The potential for cumulative effects to the identified environmental resources of concern are analyzed below for Alternatives B and C.

#### 3.25.1.4.1 Air Quality

Other identified actions within the geographic area that have the potential to contribute to additional air quality impacts include the installation of the mechanical dewatering facility and the closure of the ash impoundment. Emissions from the operation of the mechanical dewatering facility are subject to specific State of Tennessee process and fugitive dust regulations. While the emissions for this process are a minor increase over the previous conditions, they do not exceed significance levels. Closure of the ash impoundment could result in some minor emissions during the construction phase due to fugitive dust and emissions from equipment and vehicles. However, these impacts would be temporary and cease once construction activities at the site are complete.

As discussed in Section 3.1, construction of a new landfill (Alternative B) could result in some minor emissions during the construction phase, which would be temporary. During operation of the landfill, fugitive dust from the pile and transport of CCR to the landfill may impact residences or parkland areas near the site. A modification to the plant's Title V permit, fugitive dust control plan and BMPs will minimize air quality impacts. If the new CCR landfill is constructed at the proposed location such that the dust emissions from the site are concurrent with the ash impoundment closure activities, there would be potential for minor and short-term impacts. However, exceedances of applicable ambient air quality standards are not expected. Therefore, no cumulative effects to air quality are anticipated as a result of this alternative.

Under Alternative C, the transportation of CCR material to the Chestnut Ridge Landfill would extend throughout the operational phase, up to 15.5 years. This would result in potentially notable and long-term local effects on air quality. However, exceedances of applicable ambient air quality standards are not expected. Since transportation of the CCR material to Chestnut Ridge Landfill would overlap temporally with the closure of the ash impoundment, there would be potential for minor and short-term cumulative impacts. However, air quality impacts from the ash impoundment closure would be temporary and localized and cease once construction activities are complete. Therefore, exceedances of applicable ambient air quality standards are not expected and no cumulative effects to air quality are anticipated as a result of this alternative.

#### 3.25.1.4.2 Wetlands/Aquatic Ecology

The potential for cumulative effects to wetlands and the aquatic environment are largely driven by the required relocation of Worthington Branch and its tributaries and the loss of wetland area as a result of implementation of Alternative B. As described in Section 3.7 (Surface Water), the construction of the proposed landfill would require that approximately 2,158 linear ft of the stream be relocated around the project area. In addition, construction of the landfill would result in the permanent loss of 2.1 ac of wetlands. There would be no impacts to wetlands or aquatic resources under Alternative C, therefore, potential cumulative effects are not analyzed for this alternative.

Other identified actions that have the potential to contribute to aquatic resource impacts include the closure of the ash impoundment. In order to close the impoundment, the current surface water would need to be decanted. The wastewater discharges during this process would meet existing permit limits, and compliance sampling would be performed at the approved outfall structure in accordance with the NPDES permit to demonstrate compliance. Additionally, any construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources in the Clinch River.

While the impacts associated with the proposed landfill would be done in compliance with applicable TDEC and USACE 404/401 permits and any required mitigation, there would be direct, short-term impacts to aquatic species in Worthington Branch. The greatest impacts would be to less mobile and sessile organisms in the stream. During the construction phase, indirect impacts to downstream sections and any adjacent offsite streams may be associated with storm water runoff from the proposed landfill site or upstream construction activities within the stream. Construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources during the construction phase, such as in-stream sediment curtains or baffle barriers.

Given the local abundance of similar aquatic resources and wetland areas within the region and the implementation of BMPs during construction for all identified projects, watershed level cumulative impacts to aquatic and wetland resources are not anticipated under Alternative B.

#### 3.25.1.4.3 Terrestrial Ecology

Issues typically evaluated in the context of cumulative effects to terrestrial ecosystems include the potential for habitat fragmentation/degradation and the potential to enhance dispersal of invasive species. Under Alternative B, the proposed construction activities would have permanent effects to the proposed landfill site and haul route. However, terrestrial ecosystems within these impacted areas are generally previously disturbed and of low quality (see Section 3.9). Additionally, the area is already fragmented by the presence of other industrial, residential and utility development. Because most of the proposed construction activities would occur within previously disturbed lands and existing developed roads, no cumulative effects would occur related to habitat fragmentation.

The vegetation within the proposed landfill site was previously disturbed by the construction of the homes and then again by their demolition. Therefore, environments are already suspected of containing established populations of adventive and invasive species, the floristic quality of the lands potentially affected by construction is considered to be relatively poor. The proposed project would entail construction phase disturbance of plant communities that are common or of relatively low quality. Consequently, the proposed action is not expected to contribute to a cumulative effect on vegetation and floristic quality.

Alternative C is not anticipated to have cumulative impacts to terrestrial ecology as the CCR would be transported on existing roads and disposed of in a permitted landfill.

#### 3.25.1.4.4 Threatened and Endangered Species

Other identified actions within the geographic area that could impact threatened and endangered species (e.g., Indiana bat and northern long-eared bat) include the house demolition and closure of the coal ash impoundment. Demolition of the residential properties on the location of the proposed landfill, construction of an access road and development of a groundwater monitoring well required the removal of potentially suitable bat roost trees. To minimize impacts to Indiana bats potentially active in the area, the trees were removed outside of the summer roosting season. Closure of the ash impoundment would not involve any tree removal, however the open water areas of the impoundment may eliminate some low-quality foraging opportunities.

Under Alternative B, up to 48.5 ac of potentially suitable summer roost trees for the Indiana bat and northern long-eared bat would be cleared for the proposed landfill. However, this area constitutes less than 1 percent of the total forested area within a 5-mi radius of the project area. While the proposed landfill would result in a minor loss of potential roosting habitat for listed bat species, the amount of habitat available in the vicinity of the project area would provide abundant alternative locations for the bat to occupy. Additionally, avoidance and minimization efforts to reduce impacts to these species would be implemented as required through consultation with the appropriate state and federal agencies. Therefore, cumulative impacts as a result of this alternative are not anticipated.

There would be no impacts to threatened or endangered species under Alternative C, therefore, there would be no cumulative impacts.

#### 3.25.1.4.5 Visual

Among the other identified actions within the geographic area, the demolition of the residential structures and closure of the ash impoundment have the potential to contribute to additional visual impacts. The removal of the residential structures had a beneficial impact of returning the property to an undeveloped, more natural setting. Existing vegetative buffers were preserved and additional vegetation was planted along Old Edgemoor Lane to serve as a buffer. Closure of the ash impoundment would result in temporary visual discord due to additional vehicular traffic during the construction phase.

During the construction phase of the proposed landfill (Alternative B), there would be increased visual discord due to the increase in personnel and construction equipment as well as clearing and grubbing activities. During operations, this discord would be lessened as fewer personnel and equipment are needed. The proposed landfill would contribute to a decrease in the visual integrity of the landscape as the landfill increases in height, and be the most prevalent in the foreground for area residents and other passing motorists on local roads. However, these impacts are not anticipated to be significant as the remaining topography and vegetation, including that planted during the demolition of the houses, would screen some of the visual change.

While the proposed landfill would result in a visual impact to observers in the foreground, the vegetation that was planted on the site during the demolition of the houses would serve as a buffer. Therefore, cumulative impacts to visual resources under Alternative B would be minimal.

Under Alternative C, CCR material would be transported to an off-site landfill using existing transportation networks that currently support landfill traffic. Therefore, any sensitive visual receptors along the haul route are already subjected to vehicular traffic destined for the landfill and the increase in visual discord as a result of additional trucks would not alter the overall landscape. Since transportation of the CCR material to Chestnut Ridge would overlap temporally with the closure of the ash impoundment, there would be potential for minor and short-term cumulative impacts due to additional trucks on the roads. Impacts from additional vehicular traffic are expected to be insignificant as the roads are already used for industrial activity related to BRF operations. Therefore, there would be no cumulative impacts to visual resources under Alternative C.

#### 3.25.1.4.6 Environmental Justice

Other identified actions that would have an impact on EJ communities within the geographic area include the demolition of houses on the adjacent properties and closure of the ash impoundment. Any impacts to EJ communities as a result of the demolition of the houses would have been minor and limited to the demolition phase, which is now complete. Impacts to EJ communities associated with the closure of the ash impoundment include the transport of borrow material and the proposed laydown area. These would be short term and minor in nature and would be consistent across all communities (EJ and non-EJ) and would not be disproportionate to the area identified as a potential EJ population.

One area that may contain a sensitive low-income population subject to EJ considerations was identified to the north of Site J. These residents may experience visual and noise impacts as a result of landfill operation. However, this population is buffered from the proposed site by distance, vegetation and topography. These impacts may also be mitigated by various measures such as BMPs and the landscape screen. The haul road would be constructed on-site at an even greater distance from the potential EJ population and is not expected to result in adverse effects to local EJ populations.

Therefore, there is no potential for any cumulative high and adverse impacts to be disproportionately borne by low-income and minority populations. Additionally, employment opportunities would be provided to local residents to support the construction phase which would result in positive impacts to area low-income and minority populations. Therefore, adverse cumulative impacts from this alternative to EJ communities are not anticipated.

Under Alternative C, CCR material would be transported to an off-site landfill, using existing transportation networks that currently support landfill traffic. Therefore, any impacts would be consistent across all communities (EJ and non-EJ) along the haul route and would not be disproportionate to the area identified as a potential EJ population.

#### 3.25.1.4.7 Transportation

The potential for cumulative effects to transportation from other identified actions includes the closure of the ash impoundment. Traffic generated by the closure of the ash impoundment would consist of the construction workforce, shipments of goods and equipment and the hauling of borrow material to the site to be used in the closure-in-place activities. The Ash impoundment closure construction phase traffic would occur in addition to the existing traffic generated by the operation of BRF. However, once construction is completed, maintenance phase traffic associated with the closed impoundment would be negligible.

Under Alternative B, the hauling of CCR generated at BRF would not use public roadways; therefore, there is no impact to traffic and levels of service on local roads. Once constructed, traffic on New Henderson Road would be separated from landfill haul road traffic and, therefore, traffic on this roadway would not be impacted. Since public roadways would not be impacted under this alternative, there would be no cumulative effects.

Under Alternative C, the transportation of CCR material to the Chestnut Ridge Landfill would extend throughout the operational phase, up to 15.5 years. Most of the road network along this route is anticipated to have sufficient capacity remaining to handle the resulting increase in truck traffic. However, on SR 170, the addition of CCR haul traffic from BRF would have a minor to moderate impact on traffic east of BRF during peak hours of the day. Ingress/egress turning movements of construction traffic at BRF may at times be difficult and lead to unsafe conditions especially during peak hours. Construction phase traffic for the closure of the ash impoundment would increase this impact as the construction workforce would be using SR 170 to access BRF. Therefore, minor to moderate cumulative effects to transportation resources are anticipated as a result of this alternative.

#### 3.25.1.4.8 Noise

Among the other identified actions within the geographic area, the mechanical dewatering facility and closure of the ash impoundment have the potential to contribute to additional noise impacts. Since the dewatering facility is currently in operation at BRF, it is considered part of the overall noise levels for the industrial setting. The noise generated during the closure of the ash impoundment would be temporary and limited to the construction phase. Impacts to any sensitive noise receptors are not anticipated to be significant.

Under Alternative B, noise impacts would be greatest during the construction phase and during the relocation of Worthington Branch as these activities would likely require rock excavation with controlled blasting. During operation of the landfill, noise would be generated by the movement and placement of CCR material onto the landfill. The construction of the proposed landfill has the potential to overlap temporarily with the closure of the ash impoundment, which would contribute to noise impacts as a result of the construction activities and transport of borrow material to BRF. The construction activities for the ash impoundment closure may be completed before the proposed landfill is operational. Operational noise impacts associated with the proposed landfill would be similar to those during the construction phase. While the noise impacts from these projects would be cumulative, they are not anticipated to reach significant levels as the topography would attenuate noise from the landfill.

Under Alternative C, the haul route to the Chestnut Ridge Landfill would use rural arterial roadways that are characterized by an existing traffic volume that includes truck use. Increases in noise emissions along the proposed haul route as a result of the transport of CCR from BRF to the Chestnut Ridge Landfill are not expected to cause adverse effects. The potential for cumulative noise impacts from the ash impoundment closure would be associated with the transportation of borrow material from off-site locations along the existing roads. The transportation of the borrow material may increase noise levels at residences and users of parkland proximate to the haul routes used, however any impacts would be minor and limited to the ash impoundment closure construction phase. Therefore, cumulative effects to noise resources from the other identified actions are not anticipated.

#### 3.25.1.4.9 Landfill Capacity

Under Alternative B, CCR would be disposed in an onsite landfill, and there would be no impact to capacity of other landfills in the region.

Under Alternative C, CCR from BRF would be transported to an existing off-site permitted landfill. Existing Subtitle D landfills that may be considered for receipt of CCR from BRF are typically sited, sized and permitted with expectations regarding total life span and capacity for disposal within their respective service areas. While Chestnut Ridge has been considered in this analysis as the nearest receiving landfill for the purposes of assessing impacts on environmental resources, TVA has not eliminated the possibility of transporting CCR under this alternative to one or more other off-site landfills. Disposal of CCR from BRF at any off-site landfill may reasonably be expected to consume existing capacity and therefore, shorten the lifespan of the receiving landfill. The need to expand a given receiving landfill, however, is dependent upon a range of factors that include the existing permitted capacity, volume of CCR material placed within a given landfill and other market factors that would result in the placement of other non-CCR materials within the landfill.

Because of these factors and the fact that TVA has not determined with certainty whether CCR materials from BRF would be placed at Chestnut Ridge or any other receiving landfill, potential cumulative effects on environmental resources associated with the expansion of landfill capacity are remote and speculative.

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# CHAPTER 4 – REFERENCES


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B. Poulter, M. R. Raupach, P. Regnier, C. Rödenbeck, S. Saito, J. Schwinger, J. Segschneider, B. D. Stocker, B. Tilbrook, S. van Heuven, N. Viovy, R. Wanninkhof, A. Wiltshire, S. Zaehle, and C. Yue. 2014. Global Carbon Budget 2013, Earth Syst. Sci. Data 6: 689-760. doi: 10.5194/essd-6-235-2014.

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# CHAPTER 5 – LIST OF PREPARERS

## 5.1 NEPA Project Management

| | |
|---|---|
| Name: | **Anita Masters (TVA)** |
| Education: | M.S., Biology/Fisheries; B.S., Wildlife Management |
| Project Role: | TVA Project Manager, TVA NEPA Coordinator, NEPA Compliance |
| Experience: | 28 years in project management, NEPA and ESA compliance and community/watershed biological assessments. |

| | |
|---|---|
| Name: | **Bill Elzinga (Amec Foster Wheeler)** |
| Education: | M.S. and B.S., Biology |
| Project Role: | Project Manager, NEPA Coordinator |
| Experience: | 30 years of experience managing and performing NEPA analyses for electric utility industry and state/federal agencies; ESA compliance; CWA evaluations. |

## 5.2 Other Contributors

| | |
|---|---|
| Name | **Liz Hamrick (TVA)** |
| Education: | M.S., Wildlife and B.S. Biology |
| Project Role: | Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Species |
| Experience: | 17years conducting field biology, 12 years technical writing, 8 years compliance with NEPA and ESA. |

| | |
|---|---|
| Name: | **Rachel Combs** |
| Education: | B.S., Civil Engineering |
| Project Role: | TVA Engineering Program Manager |
| Experience: | 11 years' experience in civil site design/construction |

| | |
|---|---|
| Name: | **Adam Dattilo (TVA)** |
| Education: | M.S., Forestry |
| Project Role: | Vegetation, Threatened and Endangered Plants |
| Experience: | 10 years botany, restoration ecology, threatened and endangered plant monitoring/surveys, invasive species control, as well as NEPA and Endangered Species Act compliance. |

| | |
|---|---|
| Name: | **Kim Pilarski-Hall (TVA)** |
| Education: | M.S., Geography, Minor Ecology |
| Project Role: | Wetlands, Natural Areas |
| Experience: | 20 years expertise in wetland assessment, wetland monitoring, watershed assessment, wetland mitigation, restoration as well as NEPA and Clean Water Act compliance. |

| | |
|---|---|
| Name: | **Robert Marker (TVA)** |
| Education: | B.S., Outdoor Recreation Resources Management |
| Project Role: | Parks and Recreation |
| Experience: | 40 years in outdoor recreation resources planning and management. |

| | |
|---|---|
| Name: | **Carrie C. Williamson, PE, CFM (TVA)** |
| Education: | M.S., Civil Engineering; B.S., Civil Engineering; Professional Engineer, Certified Floodplain Manager |
| Project Role: | Floodplains |
| Experience: | 2 years in Floodplains and Flood Risk; 3 years in River Forecasting; 11 years in Compliance Monitoring |

| | |
|---|---|
| Name: | **Craig Phillips (TVA)** |
| Education: | M.S. and B.S. Wildlife and Fisheries Science |
| Project Role: | Aquatic Ecology and Threatened and Endangered Species |
| Experience: | 7 years sampling and hydrologic determination for streams and wet-weather conveyances; 5 years in environmental reviews |

| | |
|---|---|
| Name | **Karen Utt (TVA)** |
| Education: | JD and B.A., Biology |
| Project Role: | Climate Change |
| Experience: | 21 years of experience with environmental compliance, specializes in corporate carbon risk management and climate change adaptation planning for TVA. |

| | |
|---|---|
| Name: | **Tom Waddell (TVA)** |
| Education: | B.S., Chemical Engineering |
| Project Role: | Air Quality |
| Experience: | 30 years in air permitting and compliance, regulatory development and air pollution research |

| | |
|---|---|
| Name: | **A. Chevales Williams (TVA)** |
| Education: | B.S. Environmental Engineering |
| Project Role: | Surface Water |
| Experience: | 10 years of experience in water quality monitoring and compliance; 9 years in NEPA planning and environmental services. |

| | |
|---|---|
| Name: | **Richard Yarnell (TVA)** |
| Education: | B.S., Environmental Health |
| Project Role: | Cultural and Historic Resources |
| Experience: | 39 years, cultural resource management |

| | |
|---|---|
| Name: | **Deborah Barsotti, PhD (Amec Foster Wheeler)** |
| Education: | PhD, Pathology and B.A., Biology |
| Project Role: | Solid and Hazardous Waste |
| Experience: | 30 years of experience in human health and ecological risk assessment. |

Name: **Jonathan Bourdeau (Amec Foster Wheeler)**
Education: M.S., Mgt. Science and B.S., Forest Resources
Project Role: Terrestrial/Wildlife
Experience: 18 years of experience in natural resources studies (protected species assessments, wetlands and NEPA).

Name: **Karen Boulware (Amec Foster Wheeler)**
Education: M.S., Resource Planning and B.S., Geology
Project Role: NEPA Coordinator
Experience: 25 years of professional experience in NEPA.

Name: **J. Emmett Brown, RPA (Amec Foster Wheeler)**
Education: M.A., Anthropology and B.A., Anthropology
Project Role: Cultural Resources
Experience: 18 years of experience in development, coordination and implementation of archaeological projects.

Name: **Kelvin Campbell (Amec Foster Wheeler)**
Education: B.S., Geology, Geological Science and Hydrogeology
Project Role: Geology
Experience: 25 years of experience in geology and seismic assessment.

Name: **Steve Coates, PE (Amec Foster Wheeler)**
Education: B.S., Civil Engineering
Project Role: Transportation
Experience: 25 years of experience in conceptual design of urban and rural highway projects, environmental compliance and storm water management and civil site design and NEPA compliance.

Name: **W. Kenneth Derickson (Amec Foster Wheeler)**
Education: PhD, Biology and Ecology, M.S., Marine Biology, B.S., Biology and Natural Sciences
Project Role: Socioeconomics, Air Quality and Climate Change
Experience: More than 30 years of experience preparing Aquatic and Terrestrial Ecology, Land Use, Air Quality, Climate Change, Socioeconomics sections and managing the preparation NEPA documents.

Name: **James B. Feild, PhD, RG/PG (Amec Foster Wheeler)**
Education: PhD, Hydrogeology, M.S., Hydrogeology and B.S., Geological Oceanography
Project Role: Groundwater
Experience: Over 21 years of experience. Hydrogeological technical support.

| | |
|---|---|
| Name: | **Linda Hart (Amec Foster Wheeler)** |
| Education: | B.S. Management/Biology |
| Project Role: | Technical Editor |
| Experience: | 30 years of experience in production of large environmental documents including formatting, technical editing and assembling. |

| | |
|---|---|
| Name: | **Kenneth Paul Haywood III, FP-C, CE (Amec Foster Wheeler)** |
| Education: | M.S., Environmental Science and B.S., Environmental Science |
| Project Role: | Aquatic Ecology |
| Experience: | 8 years of experience in aquatic, marine and terrestrial ecology studies, fisheries |

| | |
|---|---|
| Name | **Wayne Ingram P.E. (Amec Foster Wheeler)** |
| Education | B.S., Civil Engineering and B.S., Physics |
| Project Role | Surface Water, floodplains |
| Experience: | 30 years of experience in surface water engineering and analysis including drainage, storm water management, water quality assessment, erosion and sedimentation, sediment transport, wetlands hydrology, stream restoration and storm water detention systems |

| | |
|---|---|
| Name: | **Brad Loomis, PE (Amec Foster Wheeler)** |
| Education: | M.S. and B.S., Civil Engineering |
| Project Role: | Transportation |
| Experience: | 10 years of experience in civil engineering design including roadway and highway; storm and sanitary sewer; airport, airport facilities and site design; railroad design; federal and military facilities and permitting |

| | |
|---|---|
| Name: | **Heather Lutz, PG (Amec Foster Wheeler)** |
| Education: | M.S., Geological Engineering - Hydrogeology and B.S., Geology |
| Project Role: | Groundwater |
| Experience: | 18 years' experience in Remediation, Investigation, Compliance, Drilling and Well Installation, Subsurface Hydrogeology, Fractured Rock Hydrogeology, Quality Assurance, Health & Safety, Waste Management and Restoration). |

| | |
|---|---|
| Name: | **Marty Marchaterre (Amec Foster Wheeler)** |
| Education: | JD, Law |
| Project Role: | Cultural Resources |
| Experience: | 25 years of experience in NEPA document preparation. |

| | |
|---|---|
| Name: | **Stephanie Miller (Amec Foster Wheeler)** |
| Education: | M.S., Biology and B.S., Marine Biology |
| Project Role: | Land Use and Prime Farmland, Visual Resources |
| Experience: | 8 years of experience in visual assessment, land use, aquatic and terrestrial ecology. |

| | |
|---|---|
| Name: | **Brian Mueller (Amec Foster Wheeler)** |
| Education: | B.S., Fisheries Biologist/Limnologist |
| Project Role: | Senior GIS Analyst |
| Experience: | 25 years in GIS applications for environmental projects. |

| | |
|---|---|
| Name: | **Lana Smith (Amec Foster Wheeler)** |
| Education: | M.S., Biology and B.S., Environmental Biology |
| Project Role: | Public Health and Safety |
| Experience: | 21 years in Health and Safety, Hazard Analysis Assessment and Health and Safety Plan development. |

| | |
|---|---|
| Name: | **Steve Stumne, PWS (Amec Foster Wheeler)** |
| Education: | B.S., Biology |
| Project Role: | Vegetation, Threatened and Endangered Species |
| Experience: | Over 20 years of experience providing natural resource investigations, NEPA analysis and documentation, wetland and stream delineation/permitting/mitigation and endangered species investigations |

| | |
|---|---|
| Name: | **Irene Weber (Amec Foster Wheeler)** |
| Education: | M.S., Biology and B.S., Plant Biology |
| Project Role: | Vegetation, Threatened and Endangered Species |
| Experience: | 5 years of experience in ecology and plant biology. |

| | |
|---|---|
| Name: | **David Zopff, PE (Amec Foster Wheeler)** |
| Education: | B.S., Chemical Engineering |
| Project Role: | Noise |
| Experience: | 29 years of experience in acoustic assessments to support NEPA documentation. |

# CHAPTER 6 –ENVIRONMENTAL IMPACT STATEMENT RECIPIENTS

## 6.1 Federal Agencies

U.S. Fish & Wildlife Service, Cookeville, Tennessee
U.S National Park Service, Atlanta, Georgia
U.S. Environmental Protection Agency, Washington, DC
U.S. Environmental Protection Agency, Region 4, Atlanta, GA
Department of Interior, Office of Environmental Policy and Compliance, Washington, DC
U.S. Army Corps of Engineers, Eastern Regulatory Field Office, Lenoir City, TN

## 6.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Alabama-Coushatta Tribe of Texas
Cherokee Nation
Coushatta Tribe of Louisiana
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Muscogee (Creek) Nation of Oklahoma
Shawnee Tribe
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

## 6.3 State Agencies

Tennessee Department of Environment Conservation, Nashville
- CCR Waste Program
- NPDES Program
- Policy and Planning Office
- Solid Waste Program
- Water-Based Systems
- Water Resources

Tennessee Department of Transportation, Nashville
Tennessee Historical Commission, Nashville
Tennessee Wildlife Resources Agency, Nashville

## 6.4 Individuals and Organizations

Chuck Bowman, P.E., Knoxville, TN
Stephanie Durman, Knoxville, TN
Zachary Fabish, Washington, DC
Amanda Garcia, Nashville, TN
Angela Garrone, Knoxville, TN
Patrick Morales, Knoxville, TN
Richard Shipley, Knoxville, TN
Axel Ringe, Tennessee
Abel Russ, Washington, DC
Luke Swartz, Clinton, TN
Mary Whittle, Philadelphia, PA
Bobby Williams, Clinton, TN

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# INDEX