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MUSCLE SHOALS SOLAR PROJECT
DRAFT ENVIRONMENTAL ASSESSMENT
Colbert County, Alabama

Prepared for:
Tennessee Valley Authority
Knoxville, Tennessee

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SYMBOLS, ACRONYMS, AND ABBREVIATIONS

°F	degrees Fahrenheit
AADT	Average Annual Daily Traffic
AC	alternating current
ADECA	Alabama Department of Economic and Community Affairs
ADEM	Alabama Department of Environmental Management
AEMA	Alabama Emergency Management Agency
AJD	approved jurisdictional determination
ALDOT	Alabama Department of Transportation
ANHP	Alabama Natural Heritage Program
APE	area of potential effect
BCC	birds of conservation concern
BMP	Best Management Practice
CAA	Clean Air Act of 1970
CaB	Capshaw silt loam
CBMPP	Construction Best Management Practices Plan
CBSA	Core Based Statistical Area
CeA	Chenneby silt loam
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
ChD	Chisca loam
CO	carbon monoxide
CO_2	carbon dioxide
DaB	Decatur silt loam
DaC2	Decatur silty clay loam
dB	decibel
dBA	A-weighted decibels
DC	direct current
DNL	day-night average sound level
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EmA	Emory Silt Loam
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
ESA	Endangered Species Act
FaB	Fullerton cherty silt loam
FaD	Fullerton gravelly silt loam
FbF	Fullerton-Bodine complex
FEMA	Federal Emergency Management Agency
FP	Fossil Plant
FPPA	Farmland Protection Policy Act
FRA	Federal Railroad Administration
ft	feet
GHG	greenhouse gas
GPS	global positioning system

SYMBOLS, ACRONYMS, AND ABBREVIATIONS

HUD	U.S. Department of Housing and Urban Development
IEEE	Institute of Electrical and Electronics Engineers
IFs	isolated finds
in.	inches
IPaC	Information for Planning and Consultation
IRP	Integrated Resource Plan
JD	jurisdictional determination
kV	kilovolt
LOS	level of service
MBTA	Migratory Bird Treaty Act
MSA	Metropolitan Statistical Area
msl	mean sea level
MVA	mega-volt ampere
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOI	Notice of Intent
NOR	Notice of Registration
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	operation and maintenance
O_3	ozone
OPGW	overhead groundwire
OSHA	Occupational Safety and Health Administration
OWR	Office of Water Resources
Pb	lead
PCS	power conversion station
PEL	permissible exposure limit
PEM	Palustrine Emergent Wetland
PFO	Palustrine Forested Wetland
PGA	peak horizontal ground acceleration
PM_{10}	particulate matter whose particles are less than or equal to 10 micrometers
$PM_{2.5}$	particulate matter whose particles are less than or equal to 2.5 micrometers
PPA	Power Purchase Agreement
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PSS	Palustrine Scrub-Shrub Wetland
PUA	Pruitton and Sullivan silt loams
PUB(x)	Freshwater Pond

SYMBOLS, ACRONYMS, AND ABBREVIATIONS

PV	photovoltaic
QCI	Qualified Credentialed Inspector
QCP	Qualified Credentialed Professional
RAM	TVA Rapid Assessment Method
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental conditions
RFP	Request for Proposal
ROI	region of interest
ROW	right-of-way
SHPO	State Historical Preservation Officer
SIP	State Implementation Plan
SMZ	streamside management zones
SO_2	sulfur dioxide
SPCC	Spill Prevention, Countermeasure and Control
STEL	short-term exposure limit
T&E	threatened and endangered
TLV	threshold limit value
TuB	Tupelo-Colbert complex
TVA	Tennessee Valley Authority
TWA	time weighted average
U.S.C.	United States Code
ug/m3	micrograms per cubic meter
US	United States
USACE	United States Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound

GLOSSARY OF TERMS

100-Year Floodplain	The area inundated by the 1 percent annual chance (or 100- year) flood.
Air Basin	A regional area defined for state air quality management purposes based on considerations that include topographic features that influence meteorology and pollutant transport patterns, and political jurisdiction boundaries that influence the design and implementation of air quality management programs.
Ambient Air	Outdoor air in locations accessible to the general public.
Area of Potential Effects (APE)	The geographic area or areas within which an action may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.
Attainment Areas	Those areas of the U.S. that meet NAAQS as determined by measurements of air pollutant levels.
Climate	A statistical description of daily, seasonal, or annual weather conditions based on recent or long-term weather data. Climate descriptions typically emphasize average, maximum, and minimum conditions for temperature, precipitation, humidity, wind, cloud cover, and sunlight intensity patterns; statistics on the frequency and intensity of tornado, hurricane, or other severe storm events may also be included.
Cumulative Impacts	Impacts that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions, regardless of what agency or person undertakes such actions (40 CFR § 1508.7).
Day/Night Average Sound Level (DNL)	A 24-hour average noise level rating with a 10 decibel (dB) penalty factor applied to nighttime noise levels. The DNL value is very similar to the community noise equivalent level value, but does not include any weighting factor for noise during evening hours.
Decibel (dB)	A generic term for measurement units based on the logarithm of the ratio between a measured value and a reference value. Decibel scales are most commonly associated with acoustics (using air pressure fluctuation data); but decibel scales sometimes are used for ground-borne vibrations or various electronic signal measurements.
Deciduous	Vegetation that sheds leaves in autumn and produces new leaves in the spring.
Direct Impacts	Effects that are caused by the action and occur at the same time and place (40 CFR § 1508.8).
Ecoregion	A relatively homogeneous area of similar geography, topography, climate, and soils that supports similar plant and animal life.
Emergent Wetland	Wetlands dominated by erect, rooted herbaceous plants, such as cattails and bulrush.

GLOSSARY OF TERMS

Endangered Species	A species in danger of extinction throughout all or a significant portion of its range or territory. Endangered species recognized by the Endangered Species Act (ESA) or similar state legislation have special legal status for their protection and recovery.
Erosion	A natural process whereby soil and highly weathered rock materials are worn away and transported to another area, most commonly by wind or water.
Evergreen	Vegetation with leaves that stay green and persist all year.
Floodplains	Any land area susceptible to inundation by water from any source by a flood of selected frequency. For purposes of the National Flood Insurance Program, the floodplain, at a minimum, is that area subject to a 1 percent or greater chance of flooding (100-year flood) in any given year.
Forest	Vegetation having tree crowns overlapping, generally forming 60-100 percent cover (Grossman et al. 1998).
Greenhouse Gas (GHG)	A gaseous compound that absorbs infrared radiation and re-radiates a portion of that back toward the earth's surface, thus trapping heat and warming the earth's atmosphere.
Habitat	A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.
Herbaceous Vegetation	Dominated by forbs, generally forming at least 25 percent cover; other life-forms with less than 25 percent cover (Grossman et al 1998).
Historic Property	Defined in 36 CFR § 800.16(l) as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places."
indirect Impacts	Effects that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR § 1508.8).
Landscape Features	The land and water form, vegetation, and structures which compose the characteristic landscape.
Landslide	A slope failure that involves downslope displacement and movement of material either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces.
Liquefaction	A condition in which a saturated cohesion-less soil may lose shear strength because of a sudden increase in pore water pressure caused by an earthquake.
NatureServe	An international network of biological inventories (natural heritage programs or conservation data centers) that provides information about the location and status of animals, plants, and habitat communities, and establishes a system for ranking the relative rarity of those resources.

GLOSSARY OF TERMS

Maintenance Area	An area that currently meets federal ambient air quality standards but which was previously designated as a nonattainment area. Federal agency actions occurring in a maintenance area are still subject to Clean Air Act conformity review requirements.
Mitigation	(a) Avoiding the impacts altogether by not taking an action or parts of an action, (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation, (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment, (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, (e) Compensating for the impact by replacing or providing substitute resources or environments (40 CFR §1508.20).
National Ambient Air Quality Standards (NAAQS)	Uniform national air quality standards established by the EPA that restrict ambient levels of certain pollutants to protect public health (primary standards) or public welfare (secondary standards). Standards have been set for ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen dioxide, and lead.
National Pollutant Discharge Elimination System (NPDES) and Water Quality Certification	The NPDES permit program was established under the Clean Water Act and controls, among other things, the discharge of stormwater associated with certain construction activities involving disturbance of one or more acres. The NPDES program has been delegated in Alabama to the Department of Environmental Management. In addition, Section 401 of the Clean Water Act requires that an applicant for a federal license or permit that allows activities resulting in a discharge to waters of the United States obtain a state certification that the discharge complies with the Clean Water Act.
Nitrogen Dioxide (NO_2)	A toxic, reddish gas formed by the oxidation of nitric oxide. Nitrogen dioxide is a strong respiratory and eye irritant. Most nitric oxide formed by combustion processes is converted into nitrogen dioxide by subsequent oxidation in the atmosphere. Nitrogen dioxide is a criteria pollutant in its own right, and is a precursor of ozone, numerous types of photochemically generated nitrate particles (including PAN), and atmospheric nitrous and nitric acids.
Nonattainment Area	An area that does not meet a federal or state ambient air quality standard. Federal agency actions occurring in a federal nonattainment area are subject to Clean Air Act conformity review requirements.

GLOSSARY OF TERMS

Ozone (O_3)	A compound consisting of three oxygen atoms. Ozone is a major constituent of photochemical smog that is formed primarily through chemical reactions in the atmosphere involving reactive organic compounds, nitrogen oxides, and ultraviolet light. Ozone is a toxic chemical that damages various types of plant and animal tissues and which causes chemical oxidation damage to various materials. Ozone is a respiratory irritant, and appears to increase susceptibility to respiratory infections. A natural layer of ozone in the upper atmosphere absorbs high energy ultraviolet radiation, reducing the intensity and spectrum of ultraviolet light that reaches the earth's surface.
Paleontology	A science dealing with the life forms of past geological periods as known from fossil remains.
Particulate Matter	Solid or liquid material having size, shape, and density characteristics that allow the material to remain suspended in the atmosphere for more than a few minutes. Particulate matter can be characterized by chemical characteristics, physical form, or aerodynamic properties. Categories based on aerodynamic properties are commonly described as being size categories, although physical size is not used to define the categories. Many components of suspended particulate matter are respiratory irritants. Some components (such as crystalline or fibrous minerals) are primarily physical irritants. Other components are chemical irritants (such as sulfates, nitrates, and various organic chemicals). Suspended particulate matter also can contain compounds (such as heavy metals and various organic compounds) that are systemic toxins or necrotic agents. Suspended particulate matter or compounds adsorbed on the surface of particles can also be carcinogenic or mutagenic chemicals. See PM_{10} and $PM_{2.5}$.
Peak Ground Acceleration (PGA)	A common measure of ground motion during an earthquake. The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place, and is dependent on the distance from the epicenter and the character of the underlying geology (e.g. hard bedrock, soft sediments, or artificial fills).
Physiographic Provinces	General divisions of land with each area having characteristic combinations of soil materials and topography.

GLOSSARY OF TERMS

PM_{10} (Inhalable Particulate Matter)	A fractional sampling of suspended particulate matter that approximates the extent to which suspended particles with aerodynamic equivalent diameters smaller than 50 microns penetrate to the lower respiratory tract (tracheo-bronchial airways and alveoli in the lungs). In a regulatory context, PM_{10} is any suspended particulate matter collected by a certified sampling device having a 50 percent collection efficiency for particles with aerodynamic equivalent diameters of 9.5 to 10.5 microns and an maximum aerodynamic diameter collection limit less than 50 microns. Collection efficiencies are greater than 50 percent for particles with aerodynamic diameters smaller than 10 microns and less than 50 percent for particles with aerodynamic diameters larger than 10 microns.
$PM_{2.5}$ (Fine Particulate Matter)	A fractional sampling of suspended particulate matter that approximates the extent to which suspended particles with aerodynamic equivalent diameters smaller than 6 microns penetrate into the alveoli in the lungs. In a regulatory context, $PM_{2.5}$ is any suspended particulate matter collected by a certified sampling device having a 50 percent collection efficiency for particles with aerodynamic equivalent diameters of 2.0 to 2.5 microns and an maximum aerodynamic diameter collection limit less than 6 microns. Collection efficiencies are greater than 50 percent for particles with aerodynamic diameters smaller than 2.5 microns and less than 50 percent for particles with aerodynamic diameters larger than 2.5 microns.
Power Purchase Agreement (PPA)	A contract between two parties, one who generates and intends to sell electricity, and one who is looking to purchase electricity, defining the commercial terms for the sale of electricity between the two parties.
Prehistoric	Refers to the period wherein American Indian cultural activities took place before written records and not yet influenced by contact with non-native culture(s).
Prime Farmland	Generally regarded as the best land for farming, these areas are flat or gently rolling and are usually susceptible to little or no soil erosion. Prime farmland produces the most food, feed, fiber, forage, and oil seed crops with the least amount of fuel, fertilizer, and labor. It combines favorable soil quality, growing season, and moisture supply and, under careful management, can be farmed continuously and at a high level of productivity without degrading either the environment or the resource base. Prime farmland does not include land already in or committed to urban development, roads, or water storage.
Riverine	Having characteristics similar to a river.
Row Crops	Agricultural crops, such as corn, wheat, beans, cotton, etc., which are most efficiently grown in large quantities by planting and cultivating in lines or rows.

GLOSSARY OF TERMS

Scrub-Shrub	Woody vegetation less than about 20 feet tall. Species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.
Slack Span	TVA defines this as the portion of transmission line which connects the new substation to the existing transmission line.
State Historic Preservation Office (SHPO)	The official within and authorized by each state at the request of the Secretary of the Interior to act as liaison for the National Historic Preservation Act.
State Implementation Plan (SIP)	Legally enforceable plans adopted by states and submitted to EPA for approval, which identify the actions and programs to be undertaken by the State and its subdivisions to achieve and maintain national ambient air quality standards in a time frame mandated by the Clean Air Act.
Subsurface	Of or pertaining to rock or mineral deposits which generally are found below the ground surface.
Sulfur Dioxide (SO_2)	A pungent, colorless, and toxic oxide of sulfur formed primarily by the combustion of fossil fuels. It is a respiratory irritant, especially for asthmatics. A criteria pollutant in its own right, and a precursor of sulfate particles and atmospheric sulfuric acid.
Threatened Species	A species threatened with extinction throughout all or a significant portion of its range or territory. Threatened species recognized by the ESA or similar state legislation have special legal status for their protection and recovery.
Upland	The higher parts of a region, not closely associated with streams or lakes.
Wetlands	Areas inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, mud flats, and natural ponds.”
Wildlife Management Area	Land and/or water areas designated by state wildlife agencies, such as the Alabama Department of Conservation and Natural Resources, for the protection and management of wildlife. These areas typically have specific hunting and trapping regulations as well as rules regarding appropriate uses of these areas by the public.
Woodland	Open stands of trees with crowns not usually touching, generally forming 25 to 60 percent cover (Grossman et al. 1998).

CHAPTER 1

1.0 INTRODUCTION

The Tennessee Valley Authority (TVA) has entered into a power purchase agreement (PPA) with Muscle Shoals Solar, LLC (referred to herein as "Muscle Shoals Solar"), to purchase the power generated by the proposed Muscle Shoals Solar Project (Project) in Colbert County, Alabama. The Project is anticipated to include up to 227 megawatts (MW) alternating current (AC) in generating capacity. The proposed solar facility would be constructed and operated by Muscle Shoals Solar. Under the terms of the conditional PPA between TVA and Muscle Shoals Solar, dated October 5, 2018, TVA would purchase the electric output generated by the proposed solar facility for an initial term of 20 years, subject to satisfactory completion of all applicable environmental reviews. In addition to purchasing the electric output under the PPA with Muscle Shoals Solar, TVA also proposes to install a temporary tap connection, followed by the construction of a new, permanent switching station. Structural upgrades to approximately 3.8 miles of transmission line connection to the Muscle Shoals Solar Project would also be required.

Following a detailed investigation of various alternatives (see Section 2.3), the proposed Muscle Shoals Solar Project has been designed to occupy approximately 2,432 acres of land located 15 miles west of Florence, Alabama (herein referred to as the "Project Site"), which is comprised of the proposed solar facility footprint (see Figure 1-1 Proposed Action Alternative Boundary). The Project also includes a transmission component (herein referred to as the transmission "ROW") that would occupy approximately 42 acres). The total area under evaluation in this EA is referred to as the "Project Area" and includes both the Project Site and the transmission ROW, a total of approximately 2,474 acres. The solar generating facility would consist of multiple parallel rows of photovoltaic (PV) panels on single-axis tracking structures, direct current (DC) to AC inverters, and transformers. The facility would be connected to TVA's existing Colbert Fossil Plant-Cherokee-Burnsville 161-kilovolt (kV) transmission line, which traverses the proposed Project Site at its northeast corner.

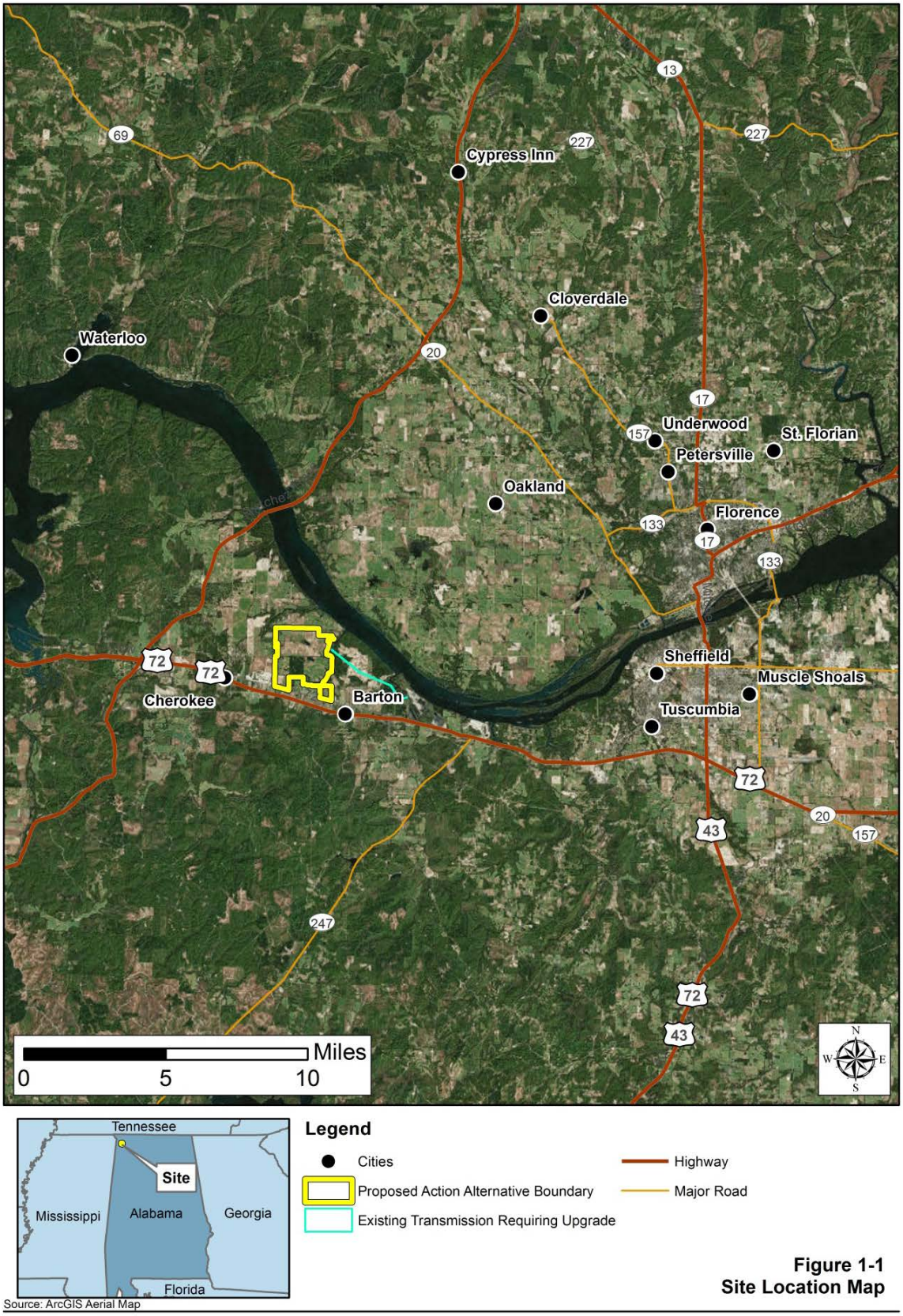


Figure 1-1. Site Location Map

1.1 PURPOSE AND NEED FOR ACTION

TVA produces or obtains electricity from a diverse portfolio of energy sources, including solar, hydroelectric, wind, biomass, fossil fuel, and nuclear. In 2015, TVA completed an Integrated Resource Plan (IRP) and associated Environmental Impact Statement (EIS) (TVA 2015). The IRP identified the various resources that TVA intends to use to meet the energy needs of the TVA region over the 20-year planning period while achieving TVA's objectives to deliver reliable, low-cost, and cleaner energy while reducing environmental impacts. Cost-effective renewable energy, including energy generated by solar PV, is one of the energy resources recommended in the IRP. Since 2015, TVA has undertaken several efforts to increase the amount of renewable energy in its generation portfolio. The Proposed Action would provide cost-effective renewable energy consistent with the IRP and TVA goals.

TVA's 2015 IRP (TVA 2015) reinforced the continued expansion of renewable energy generating capacity, including the addition of between 175 and 800 MW (AC) of solar capacity by 2023. In addition, in 2017, customer demand prompted TVA to release a Request for Proposal (RFP) for renewable energy resources ("2017 Renewable RFP"). The PPAs that resulted from this RFP will help TVA meet immediate needs for additional renewable generating capacity in response to customer demands and fulfill the renewable energy goals established in the 2015 IRP.

1.2 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Pursuant to the National Environmental Policy Act of 1969 (NEPA) and the Act's implementing regulations promulgated by the Council on Environmental Quality ([CEQ]; 40 Code of Federal Regulations [CFR] 1500-1508), federal agencies are required to evaluate the potential environmental impacts of their proposed actions. This environmental assessment (EA) was prepared to assess the potential impacts of TVA's Proposed Action (the purchase of power under the PPA) on the environment in accordance with CEQ's and TVA's procedures for implementing NEPA (TVA 1983).

TVA's Proposed Action would result in the construction and operation of the proposed solar facility by Muscle Shoals Solar and actions taken by TVA to connect the solar facility to the TVA transmission system. The scope of this EA therefore focuses on impacts related to the construction and operation of the proposed solar facility and associated modifications to the TVA transmission system.

This EA (1) describes the existing environment at the Project Site, (2) analyzes potential environmental impacts associated with the Proposed Action and the No Action Alternative, and (3) identifies and characterizes potential cumulative impacts from the proposed Project in relation to other ongoing and reasonably foreseeable proposed activities within the surrounding area of the Project Site.

Under the PPA, TVA's obligation to purchase renewable power is contingent upon the satisfactory completion of the appropriate environmental review and TVA's determination that the Proposed Action will be "environmentally acceptable." To be deemed acceptable, TVA must

assess the impact of the Project on the human environment to determine whether (1) any significant impacts would result from the location, operation, and/or maintenance of the proposed Project and/or associated facilities, and (2) the Project would be consistent with the purposes, provisions, and requirements of applicable federal, state, and local environmental laws and regulations.

Based on internal scoping and identification of applicable laws, regulations, executive orders, and policies, TVA identified the following resource areas for analysis within this EA: Land Use; Geology, Soils, and Prime Farmland; Water Resources; Biological Resources; Visual Resources; Noise; Air Quality and Climate Change; Cultural Resources; Natural Areas and Recreation; Utilities; Waste Management; Public and Occupational Health and Safety; Transportation; Socioeconomics; and Environmental Justice.

This EA consists of six chapters discussing the Project alternatives, resource areas potentially impacted, and analyses of these impacts. Additionally, this document includes seven appendices, which generally contain more detail on technical analyses and supporting data. The structure of the EA is outlined below:

- **Chapter 1.0:** Describes the purpose and need for the Project, the decision to be made, related environmental reviews and consultation requirements, necessary permits or licenses, and the EA overview.
- **Chapter 2.0:** Describes the Proposed Action and No Action Alternatives, provides a comparison of alternatives, and discusses the Preferred Alternative.
- **Chapter 3.0:** Discusses the affected environment and the potential direct and indirect impacts on these resource areas. Mitigation measures are also proposed, as appropriate.
- **Chapter 4.0:** Discusses the cumulative impacts in relation to other ongoing and reasonably foreseeable proposed activities within the surrounding area of the Project Site.
- **Chapters 5.0 and 6.0:** Contain the List of Preparers of this EA and the Literature Cited in preparation of this EA, respectively.
- **Appendix A:** TVA ROW Clearing Specifications
- **Appendix B:** TVA Environmental Quality Protection Specifications for Transmission Line Construction
- **Appendix C:** TVA Transmission Construction Guidelines near Streams
- **Appendix D:** TVA Environmental Quality Protection Specifications for Transmission Substation or Communications Construction
- **Appendix E:** TVA ROW Vegetation Management Guidelines 2013
- **Appendix F:** Consultation Information
- **Appendix G:** Natural Resources Report (Wetlands and Protected Species)

1.3 PUBLIC INVOLVEMENT

Copies of this draft EA were mailed to government agencies and individuals who indicated an interest in the Project. TVA notified interested federally-recognized Native American Tribes, elected officials, and other stakeholders that the draft EA was available for review and comment for a 30-day period. An electronic version of the document was posted on the TVA website where comments could also be submitted online. Public notices were published in local newspapers soliciting comments from other agencies, the general public, and any interested organizations.

1.4 REQUIRED PERMITS AND LICENSES

1.4.1 Solar Facility

An Alabama Construction General Permit (National Pollutant Discharge Elimination System [NPDES] Permit No. ALR100000) would be required for the construction of the Preferred Alternative. NPDES Permit No. ALR100000 is a general permit authorizing stormwater discharges associated with construction activities that result in a total land disturbance of 1 acre or greater. Construction-site operators/owners seeking coverage under this general permit must submit a Notice of Intent (NOI) and Notice of Registration (NOR) in accordance with the permit requirements prior to any construction activities. The NOI and NOR include permittee information, facility information, total acreage of the site, total acreage of disturbed area, and receiving waters for the stormwater discharge points. Information listed in the NOI must be certified by a Qualified Credentialed Professional (QCP) in the State of Alabama. Once the NOI has been submitted to the Alabama Department of Environmental Management (ADEM) and approved, ADEM will issue an authorization number that must be displayed at the facility.

In conjunction with erosion and sediment control plans that are required for the Construction General Permit, a Construction Best Management Practices Plan (CBMPP) is required by ADEM as a means to gather and communicate environmental commitments and contractor requirements related to erosion and sediment control. The design components of the CBMPP (i.e., erosion and sediment control plans) must be certified by a QCP in the State of Alabama prior to any construction or land-disturbing activities. During construction, application and implementation of Best Management Practices (BMPs) related to the erosion and sediment control plan must be inspected periodically by a Qualified Credentialed Inspector (QCI) in the State of Alabama and recorded in the CBMPP. During operations, module washing would occur no more than twice a year and would use BMPs and a CBMPP to prevent any soil erosion or stream and wetland sedimentation. A list of potential permits, approvals, and licenses required for the Project is presented in Table 1.4-1.

Table 1.4-1. Muscle Shoals Solar Permit and Approval List

Permit/Approval	Associated Documentation	Lead Agency
Federal Permits & Approvals		
Endangered Species Act Section 7 informal consultation	Biological resources survey results	United States Fish and Wildlife Service (USFWS)
State Permits, Approvals, Registration, or Coordination		
§106 National Historical Preservation Act consultation	Cultural resources survey results	Alabama State Historic Preservation Officer (SHPO)
National Pollutant Discharge Elimination System (NPDES) Permit (if necessary)	Notice of Intent associated with existing General Permit	ADEM
Alabama General Construction Permit (ALR100000)	Construction-site Erosion Prevention and Sediment Control (EPSC) plans	ADEM
CBMPP	Along with the necessary application fees, project drawings, including plan view and cross sections	ADEM
State Wildlife Coordination	Biological resources survey results	Alabama Division of Wildlife and Freshwater Fisheries
Surface Water Withdrawal Registration (only if capacity to withdraw is 100,000 gallons per day or more)	Office of Water Resources (OWR) requires registration of facility and Certificate of Use to be obtained	Alabama Department of Economic and Community Affairs (ADECA) OWR
Groundwater Withdrawal Registration (only if capacity to withdraw is 100,000 gallons per day or more)	OWR requires registration of facility and Certificate of Use to be obtained	ADECA-OWR

1.4.2 Transmission Interconnection

An Alabama Construction General Permit (NPDES Permit No. ALR100000) would also be required for the construction of the associated transmission interconnection. Permitting and licensing requirements would be reviewed on a site-specific basis after further study confirms the specific upgrades necessary and the location of the transmission connection. Generally, however, a permit would be required from ADEM for the discharge of construction-site stormwater associated with construction upgrades to the existing transmission line. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit may also be required for burning trees and other combustible materials removed during transmission line construction. A Section 404 Nationwide or Individual Permit would be obtained from the United States (U.S.) Army Corps of Engineers (USACE) for the discharge of dredge or fill into waters of the United States, if applicable.

CHAPTER 2

2.0 DESCRIPTION OF THE PROPOSED SOLAR PROJECT AND ALTERNATIVES

This chapter explains the rationale for identifying the alternatives to be evaluated, including the No Action Alternative required by NEPA, describes each alternative, provides a comparison of alternatives with respect to their potential environmental impacts, and identifies the Preferred Alternative.

2.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, TVA would not purchase the power generated by the Project under the 20-year PPA with Muscle Shoals Solar, and TVA would not be involved with the Project. If TVA were to select this alternative, and Muscle Shoals Solar elected not to proceed with the Project, then Muscle Shoals Solar would not construct any facility on any tracts of land in Colbert County, Alabama, and TVA would not make the associated modifications to its transmission system. Muscle Shoals Solar would not complete the purchase of the property necessary to construct the Preferred Alternative. Existing conditions would remain unchanged (i.e., property would remain as predominantly-disturbed agricultural land) and agricultural activities would likely continue. In addition, TVA would continue to rely on other sources of generation described in the 2015 IRP (TVA 2015) to ensure an adequate energy supply and to meet its goals for increased renewable and low greenhouse gas (GHG)-emitting generation.

Under the No Action Alternative, there would be no project-related changes to land use, natural resources, or socioeconomics in the immediate future.

2.2 PROPOSED ACTION

Under the Proposed Action, Muscle Shoals Solar would acquire approximately 2,432 acres of land in Colbert County, Alabama and construct, operate, and maintain a single-axis tracking photovoltaic (PV) solar power facility of up to 227 MW AC generating capacity. The energy generated by the Project would be sold to TVA in accordance with the terms of the PPA. The Project would be located on 17 contiguous parcels of agricultural land in Colbert County, Alabama. These parcels total approximately 2,432 acres and comprise the Project Site, which is located approximately 15 miles west of the City of Florence, Alabama (Figure 2-1). Muscle Shoals Solar would construct a Project Substation (the Muscle Shoals Project Substation) at the Project Site. The Project would interconnect to TVA's existing Colbert Fossil Plant (FP)-Cherokee-Burnsville 161-kV transmission line, which traverses the Project Site at its northeast corner. TVA would construct a line-tap into the existing transmission line to connect a proposed new TVA switching station (the Mulberry Creek Switching Station) also located on the Project Site. This EA assesses the impact of TVA's action of entering into the PPA with Muscle Shoals Solar, the associated impacts of the construction and operation of the proposed solar facility by Muscle Shoals Solar, and the transmission interconnections and switching stations by Muscle Shoals Solar and TVA.

2.2.1 Project Description

The Project Site consists of several contiguous parcels of land currently owned by multiple private parties. The Project Site is located approximately 3 miles east of the Town of Cherokee, in Colbert County, Alabama, and approximately 15 miles west of the City of Florence, Alabama. The Project Site is located within the Florence–Muscle Shoals metropolitan area known as "The Shoals". Located off Old Lee Highway between county roads Moody Lane and Mulberry Lane, the Project Site may be reached using U.S. Highway 72.

The Proposed Action also includes the construction of upgrades to existing TVA transmission structures to connect the Project to the existing TVA 161-kV Colbert FP-Cherokee-Burnsville transmission line (Figure 2-1).

The Project Site layout is shown in Figure 2-2 and would occupy approximately 2,432 acres, of which, approximately 1,927 would be permanently disturbed. Approximately 166 acres of exclusion areas were identified by Muscle Shoals Solar as being restricted from any development or construction activities; these areas, illustrated in red hatching on Figure 2-3, are considered not useable for the Project, because they contain wetlands, floodplains, sensitive resources, and/or excessive slope. An existing conservation easement (approximately 66 acres) is located in the center of the Project Site (Figure 2-2) and this area will be avoided by the Project. This conservation easement was established in 2001 (with a term of 30 years) by the previous landowners and the United States/Commodity Credit Corporation Wetland Reserve Program. Figure 2-2 shows permanent access to this conservation easement from Mulberry Lane along with three permanent entrances and one non-permanent entrance to the Site from Mulberry Lane. Further access to the Site is achieved through a permanent entrance and a non-permanent construction entrance on Moody Lane. In addition to the solar arrays which would comprise the majority of the Project Site, a new Muscle Shoals Project Substation would be located on approximately 5 acres in the northeast corner; in the Project Substation, medium voltage power generated by the solar facility would be stepped-up to high-voltage for transfer onto TVA-owned infrastructure. Next to the Project Substation, TVA would construct the new high-voltage Mulberry Creek Switching Station, also on approximately 5 acres. Additional dead-end support structures may need to be installed to support the loop-in-loop-out of the existing 161-kV transmission line to the TVA Mulberry Creek Switching Station. A microwave radio frequency tower may also be required in the Project Substation if sufficient telecom availability does not exist near the Project Site.

PV power generation is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current is produced, which can be used as electricity. This project would convert sunlight into DC electrical energy within thin-film semiconductor PV modules (Photo 2-1). The solar arrays utilized for the proposed facility would be composed of ground-mounted thin film cells. The PV modules are each capable of producing approximately 410 to 450 watts and would be mounted together in arrays. These arrays would be grouped into individual blocks with an output of approximately 2.0 to 4.0 mega-volt ampere (MVA) AC. Each block would consist of PV modules

configured into arrays and a power conversion station (PCS), which would include inverters and transformers to convert the DC electricity generated by the solar panels into AC electricity for transmission across the Project's electrical collection system and to the on-site Project Substation. The current design reflects that the facility could be grouped into five AC collection blocks, with each block made up of approximately 10 to 15 arrays. There are several different array configurations to account for varying site constraints and land utilization, but generally each array would consist of approximately 8,000 to 10,000 Series 6 (or functional equivalent) modules. Although any array using Series 4 modules would require more modules, the project area would remain the same regardless of the specific module used. The exact number of blocks, arrays, and modules will be finalized during detailed design at project execution.

There would be several access roads internal to the site to allow access to the arrays and PCS skids for operations and maintenance purposes. These unpaved roads typically consist of compacted native soils or aggregate base gravel where needed. Temporary laydown or staging areas would be used for stockpiling and storage of construction materials and workers during different phases of construction. Detention basins will be utilized on site to protect against flooding and downstream erosion into protected jurisdictional wetlands and waterways. Figure 2-2 also shows an overhead electrical connector which would be installed to connect the isolated area of panels in the southeast corner of the site. The exact location/alignment of the overhead connector would be in the least vegetation-dense area as possible. The span(s) between poles/support structures for the overhead connector would be between 300 ft and 600 ft apart. No poles would be placed within the (jurisdictional) wetlands (or 100-year floodplain). Vegetative maintenance (e.g. tree trimming during the winter season) would be required to allow for proper clearance of collector lines once the overhead connector has been constructed, and throughout the operational life of the Project.

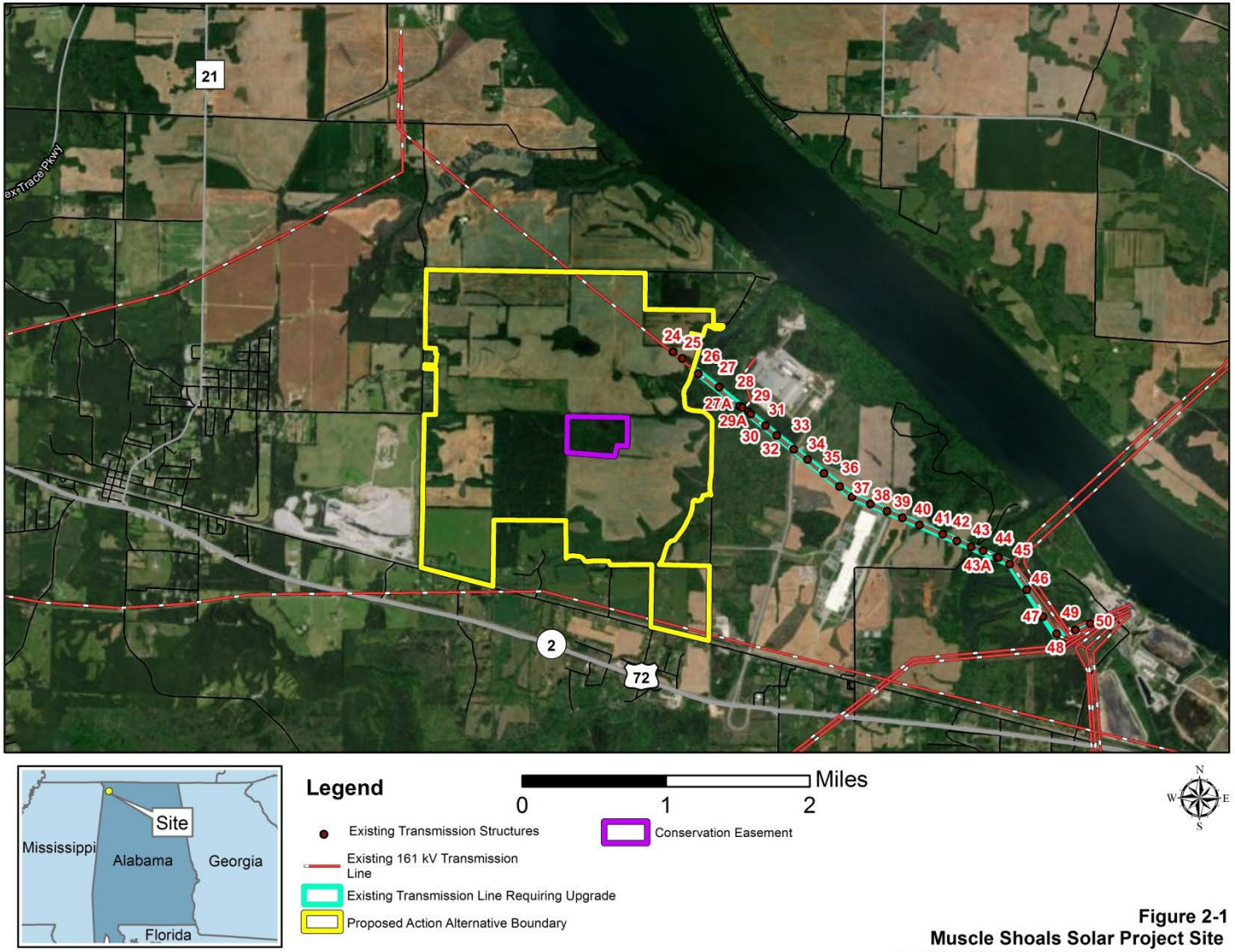


Figure 2-1. Muscle Shoals Solar Project Site and Transmission Line Location Map

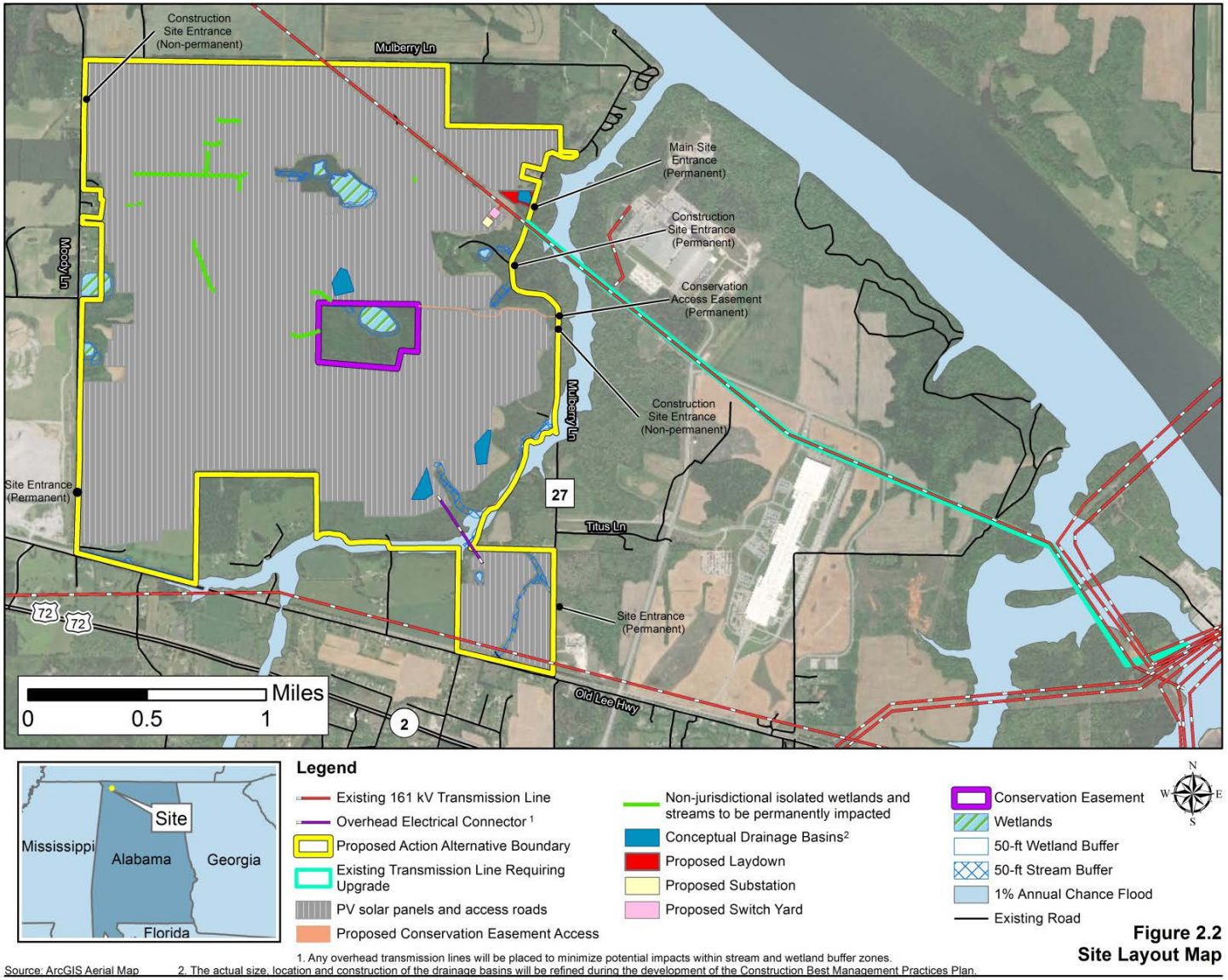


Figure 2-2. Site Layout Map

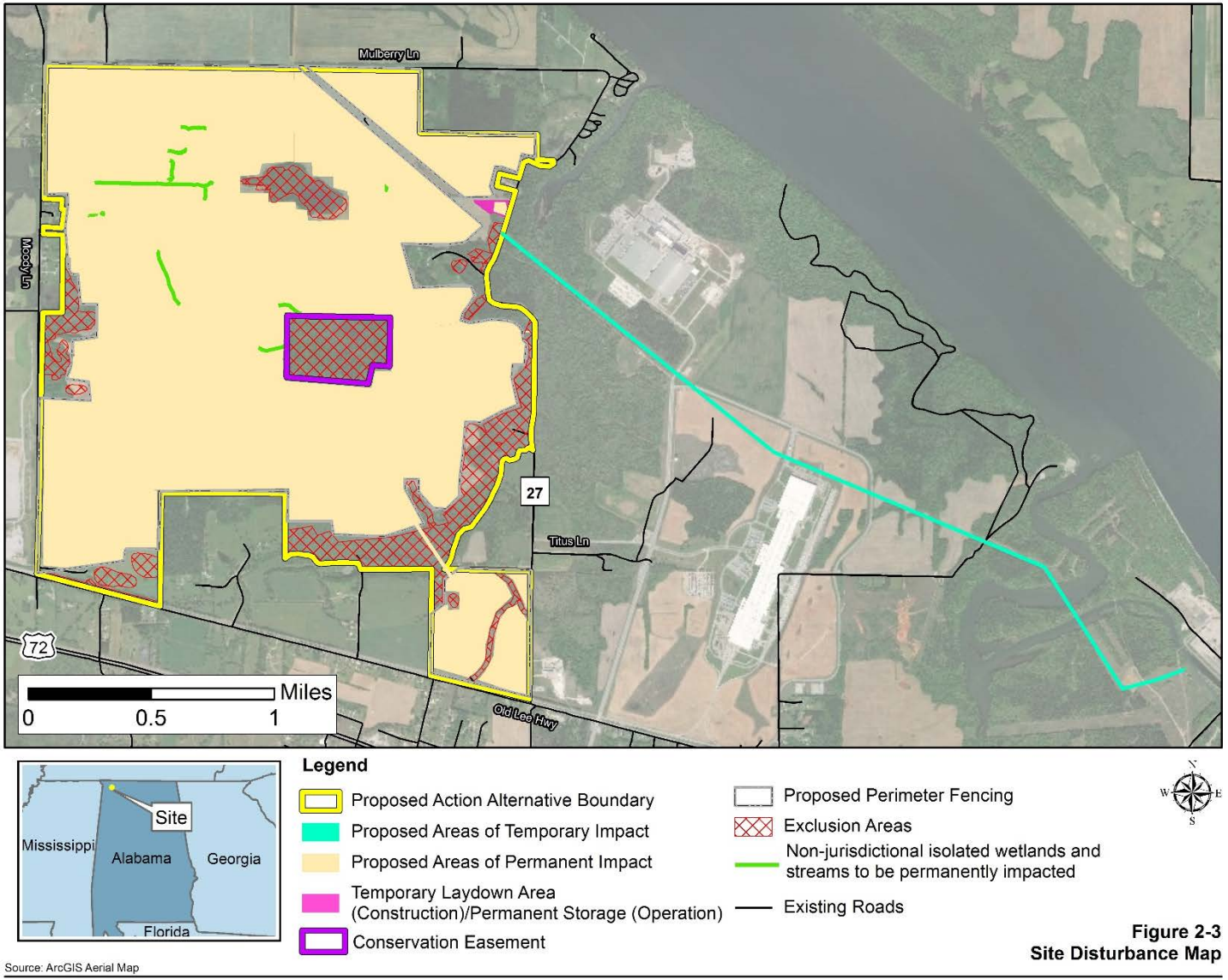


Figure 2-3. Site Disturbance Map

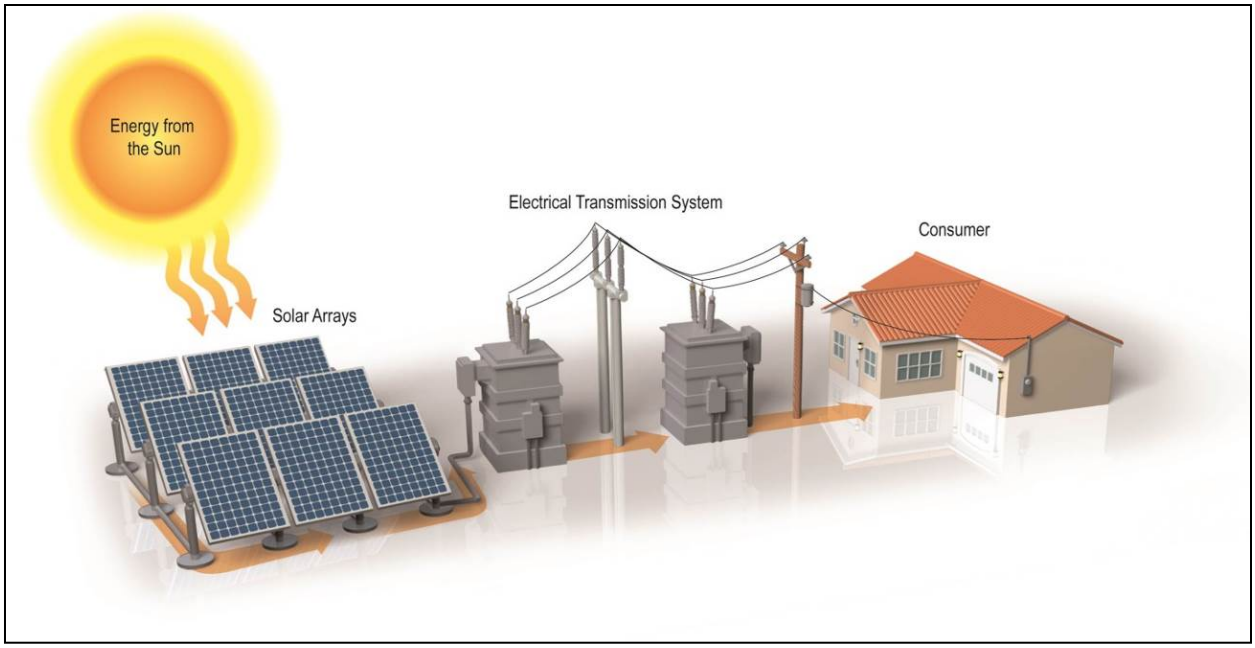


Photo 2-1. General Energy Flow Diagram of PV Solar System

Wetlands and/or streams would not be impacted directly. Some periodic maintenance activities would be required to keep the corridor(s) cleared to a certain height.

For this project, Muscle Shoals Solar would utilize recently-released large format PV modules known as Series 6 (or functional equivalent) manufactured by First Solar, Inc. These panels were designed with an under-mount frame which facilitates natural snow shedding and cleansing benefits of rainfall. The PV panels would be mounted on a motor-operated axis tracker structure, commonly referred to as a single-axis tracker. The axis tracker would be designed to follow the path of the sun from the east to the west across the sky. The tracker assemblies would be constructed in parallel north-south rows using steel piles installed using a pile driver with an approximate depth of 6 to 10 feet (ft) below grade (Photo 2-2); for

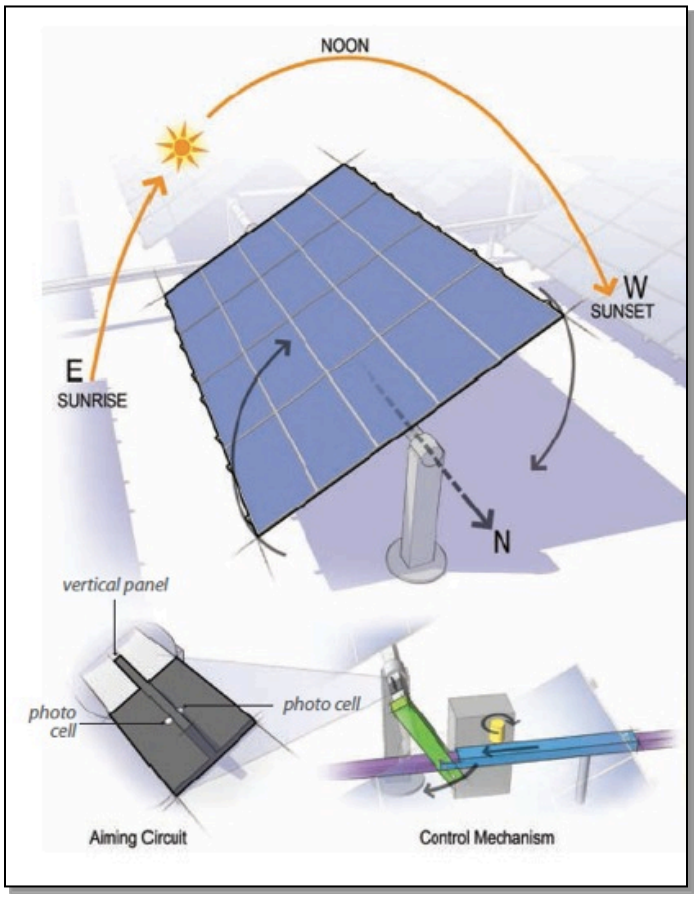


Photo 2-2. Diagram of Single-Axis Tracking System

isolated instances of poor quality soil, which are not anticipated for this Project, longer piles and/or helical piles may be used.

The PV modules would be electrically connected using the Series 6 (or functional equivalent) dual junction box design. A combiner box at the end of each module row would collect power from several strings of modules and feed a PCS via cables. DC cabling may be routed above-ground or mounted to the tracking structures on cable trays or other equivalent management systems.

Each PCS consists of a unit containing several power inverter units electrically-connected to the adjacent transformers and mounted on concrete pads or piers. The PCS would be approximately 8 to 10 ft tall and approximately 40 ft long; the transformer enclosure would be approximately 6.5 ft tall. The inverters change the DC output from the combiner boxes into AC electricity. The resulting AC current from each individual PCS would then be transformed at the adjacent pad-mounted transformers into the AC collection voltage, typically 34.5 kV. The medium voltage collection circuits (either direct-buried or mounted on overhead pole structures) function to deliver AC electricity from the PCSs to the Project Substation.

2.2.2 Construction

Site preparation (surveying and staking, removal of tall vegetation, grading, clearing and grubbing as needed, installation of a perimeter security fence and area lighting as required for security and compliance with local ordinance, and preparation of construction laydown or staging areas) is generally required prior to solar array assembly and construction of the solar facility, which includes driving steel piles for the tracker support structures, installation of solar panels, and electrical connections and testing/verification.

Muscle Shoals Solar would utilize industry standard practices to work with the existing landscape (e.g., slope, drainage, utilization of existing roads) where feasible and minimize or eliminate grading work to the extent possible. Any required grading activities would be performed with portable earthmoving equipment and would result in a relatively consistent slope to local land areas. Prior to grading, native topsoil would be removed from the area to be graded and stockpiled on-site for redistribution over the disturbed area after the grading is completed. Silt fence and other appropriate controls would be used (as needed) to minimize exposure of soil and to prevent eroded soil from leaving the work area. Disturbed areas would be seeded post-construction using a good mixture of certified weed-free, low-growing native grass seed. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has returned to the pre-construction conditions or the site is stable.

Grading would consist of the excavation and compaction of earth to meet the final design requirements. Due to the existing topography of the site and the use of single-axis tracking, cut and fill grading activities would be required to achieve the final design and maximum slope criteria. Grading could include stripping, cutting, filling, stockpiling or any combination thereof. Grading activities at the site are expected to result in a net zero balanced cut and fill quantity of earthwork to the extent practical and therefore not require any off-site or on-site hauling. Clearing and grubbing could include the removal of trees, shrubs, and vegetation.

A project grading plan will be finalized during the design process. For the purposes of this EA, the proposed areas of temporary (e.g., laydown areas) and permanent disturbance (e.g., structures and panel footprints) are illustrated on Figure 2-3. Exclusion areas were identified by Muscle Shoals Solar as being restricted from any development or construction activities; these areas, illustrated in red hatching on Figure 2-3, are considered not useable for the Project, because they contain wetlands, floodplains, sensitive resources, and/or excessive slope. This site disturbance map shows that approximately 1,927 acres of the Project Site could be subject to grading and/or ground-disturbing activities and approximately 44 acres would be temporarily disturbed, including mowing and light surface preparation (i.e., clearing/grubbing of existing vegetation). The mowing and light surface preparation would be similar in nature to that of the current on-site agricultural activities. Where necessary, tall vegetation would be removed from both permanently and temporarily disturbed areas to reduce shading and maximize power production. Buffers of 50 ft would be maintained along each side of jurisdictional wetlands and streams (100 ft total width) as a conservative avoidance measure. Figure 2-3 identifies non-jurisdictional wetlands and streams which could become areas of permanent disturbance (i.e., converted to support solar panels). The remaining jurisdictional wetlands and streams shown on Figure 2-2 would be avoided during construction to the greatest extent feasible, although some work could be expected to occur within the buffer zones. Specifically, small crossings or culverts could be installed over small non-jurisdictional streams (if necessary) to access collection blocks once the final design is determined. Since these are non-jurisdictional features, no permits would be required. Once areas to be avoided are marked, construction areas would be cleared and mowed of vegetation and miscellaneous debris. Ongoing mowing and clearing operations would continue, as needed, to control vegetation growth during construction (Figure 2-3).

Four on-site stormwater detention basins (totaling approximately 14 acres) would be constructed in appropriately designed locations on the Project Site (Figure 2-2). The final design and exact position of these conceptual drainage basins within the Project Site boundaries would be based on the most recent hydrology study and would function to temporarily store stormwater, minimize erosion, and reduce the rate of runoff. These basins would be constructed either by impoundment of a natural depression(s) or by excavating the existing soil. The bottom elevation and embankments of the ponds would be allowed to naturally reestablish native vegetation after construction (or be replanted as necessary) to provide natural stabilization, minimizing subsequent erosion. Water from the ponds would be released through specially designed outlet or discharge structures, which control the rate of outflow.

Water would be needed for soil compaction and dust control during construction, including on access roads, as a standard BMP. Water would be needed to a lesser extent during operations for minor dust control and domestic use. During construction, the primary water use would be for dust control during grading activities. As grading activities are completed, overall Project water requirements would decrease, and construction-related dust control would be the primary water use. Portable toilets would be available on-site for the duration of the construction period. There are no planned habitable buildings on-site that would need potable water or septic systems for waste disposal.

Water in sufficient quantity and of the requisite quality is expected to be made available for this Project through use of on-site groundwater wells or delivery via water trucks; however, due to the temporary nature of the need for water only during construction, utilizing groundwater for construction activities is the preferred approach. Muscle Shoals Solar would determine daily water requirements based on the preliminary grading plan and size the new on-site wells. Muscle Shoals Solar will perform groundwater drilling and testing work prior to full construction to generate data on aquifer characteristics and develop a plan for the production well design. Between two to four on-site groundwater supply wells would be utilized for the Project (depending on flow capacity of each well). The exact location of the wells would be identified in the final design. The wells would be spaced around the Project Site to provide easy access for construction water and to reduce the potential for any significant water level drawdown. The well field would include a sufficient number of standby wells to provide water in the event the primary wells are shut down for maintenance.

Construction of production wells would consist of conventional well-drilling techniques. A truck-mounted drilling rig would be set up at the identified installation location. No permanent drilling pad would be constructed, although gravel in the area would likely be used to temporarily stabilize the surface. Water based drilling muds (if required) would be collected and dewatered, with runoff occurring locally into nearby field areas. Because dewatered muds would be non-toxic, they could be spread as subsoil as part of the Project Site grading. Well construction would take place using power from the drilling truck, and a portable generator would be used for initial well testing and construction production. Well production during operation would be powered with electric motors off of the Project distribution power system.

A temporary construction yard/laydown area (approximately 2.7 acres; Figure 2-2) would be utilized during construction for job office trailers, equipment storage, material storage, and employee parking. The construction yard would be built shortly after Site access is granted to begin construction and would be utilized throughout the construction period. Once all Project equipment and materials have been installed, a portion of the construction yard may be reclaimed and converted into a detention basin (Figure 2-2).

Series 6 solar modules (or functional equivalent) are designed for quick and easy two-person installation. Thus, the array assembly would occur on-site adjacent to the installation point. The mounting system likely to be selected for the Project would be manufactured by NEXTracker, or a functional equivalent tracking system would be used. Components of the mounting system would be pre-assembled by the manufacturer to the extent practicable and/or assembled at the site of installation. The system utilizes a bottom clamp system for installing Series 6 solar modules (or functional equivalent). In this solar tracker mounting system, a shared rail self-locates underneath the frames of two adjacent modules, reducing handling and install times. A single set of clamps are mounted to this rail, which are used to secure the two modules. During installation, the clamps pass through the module frame mounting slots and are then tightened to the mounting rail. Grounding of the module frame to the tracker structure is built-in to the rail system, without need for additional grounding components. Longer rows improve tracker economics and simplify DC wiring. Final assembly typically involves tractors and forklifts to place the trackers onto the support structures. The tracker assemblies would be arranged in

parallel north-south rows. During this work, multiple crews and vehicles would be working on the solar facility (average of 200 to 300 workers on-site per day would either carpool or drive individually), including flatbed trucks for transporting the arrays (approximately 15 semi-tractor trailer trucks or other large vehicles visiting the site per day during a 6-month portion of the construction activities).. Array construction vehicles would include pick-up trucks to transport materials and workers on access roads and array aisles. A list of construction vehicles and their estimated usage is provided in Table 3.6-1. Access roads are typically 20 to 25 ft wide or less consisting of 12 inches of compacted native subgrade material and surfaced with 6 inches of compacted gravel. Access roads would be graded to slope of existing ground conditions, which would allow for proper drainage.

Typically, tracker support structures are constructed using steel piles. The driven steel pile foundation is typically galvanized and used where high load bearing capacities are required. The pile is driven with either a hydraulic ram or vibratory action. Soil disturbance is restricted to the pile insertion location with temporary disturbance from the hydraulic ram machinery, which is about the size of a small tractor. Adverse soil conditions may necessitate the use of screw piles which are driven into the ground with a truck-mounted auger. Screw piles create a similar soil disturbance footprint as driven piles.

Solar panels would be manufactured off-site and shipped to the Site ready for installation. Once most components are placed on their respective foundations and structures, electricians and support workers would run the electrical cabling throughout the solar field.

After the equipment is electrically connected, electrical service would be tested, motors checked, and control logic verified. As the solar arrays are installed, the balance of the Project would continue to be constructed and installed and the electrical power and instrumentation would be placed. Once the individual systems have been tested, integrated testing of the Project would occur.

The proposed Project would also include both a Project Substation and the Mulberry Creek Switching Station (Figure 2-2). Transmission system/electrical interconnection details are provided in Section 2.2.3 below.

The 2,474-acre Project Site consists of 17 contiguous parcels which would be acquired for the Project. For parcels which have existing structures, it would be expected that most would be demolished or relocated; however, some structures could ultimately be excluded from the Project boundary. Due to the terrain and the large amount of agricultural land in the immediate vicinity, construction and operation of the Proposed Action would be visible from up to 1 mile away. For any existing occupied, residential structure within 200 ft of a solar panel where there is no existing vegetative buffer present, a vegetative buffer would be installed to create a screen for such residence. Security fencing would be installed prior to construction (Figure 2-3) and would remain in place for the duration of the Project operation. Construction would be executed by utilizing local subcontractors and larger national and international subcontractors (where required) to supplement local resources. Construction activities for the Project would take approximately 12 months to complete using a crew that ranges from 200 to 300 workers.

Work would generally occur Monday through Friday from 7 am to 7 pm. Additional hours could be necessary to make up schedule deficiencies or to complete critical construction activities. During the Project startup phase, equipment and system testing and similar activities could continue 24 hours per day, 7 days a week.

2.2.3 Electrical Interconnection

Under the Proposed Action, Muscle Shoals Solar would connect to the existing TVA Colbert FP-Cherokee-Burnsville 161-kV transmission line (TL). The connection would be made at the northeastern corner of the Project Site, on the Colbert FP-Cherokee-Burnsville 161-kV TL between structures 24 and 25. This section of the Colbert FP-Cherokee-Burnsville line traverses the Project Site as shown in Figure 2-1. TVA plans to take a two-phased approach as further described below: (1) TVA will provide a temporary tap connection; followed by (2) the construction of a new, permanent switching station. TVA would become the fee-simple owner of the land underlying the permanent switching station and would have a permanent access easement granted to it from Mulberry Lane through the Project Site. No new transmission lines or rights-of-way (ROW) are required for this Project; however, some structural upgrades would be made on a portion of the nearby existing transmission line. The portion of existing transmission line ROW requiring upgrades is shown on Figure 2-2 and is approximately 3.8 miles long and 100 ft wide (corridor).

To facilitate the operation of the proposed site and transmission line connection, TVA proposes to also undertake the following additional activities in two phases:

Phase I activities

- Installation of fiber-optic overhead groundwire (OPGW) on approximately 3.8 miles of the Colbert FP-Cherokee-Burnsville 161-kV transmission line from the Muscle Shoals Solar interconnection to the Colbert FP Switchyard;
- Replacement of structures 26, 27, 40, 41, and 46 on the Colbert FP–Cherokee-Burnsville 161-kV transmission line to accommodate the installation of the OPGW;
- Installation of telecommunications connections at the Colbert FP and Burnsville substations and South Jackson and Tupelo 161-kV substations; and
- Modification of TVA system map boards to include names and numbers of the new transmission line and Mulberry Creek Switching Station.

Phase II activities

- Installation of telecommunications connections at Mulberry Creek 161-kV Switching Station, Colbert FP and Burnsville substations, and South Jackson and Tupelo 161-kV substations; and
- Modification of TVA system map boards to include names and numbers of the new Mulberry Creek Switching Station.

2.2.3.1 Right-of-Way Clearing

Although this Project does not include the addition of any new transmission lines or ROW (i.e., no ROW acquisition is required), upgrade activities within an approximately 3.8-mile long stretch of existing transmission line ROW would be necessary.

Because the area in which the proposed transmission line upgrades would occur is within the existing transmission line ROW, limited clearing would be expected within the existing ROW . In areas where clearing is needed to maintain adequate clearance between tall vegetation and transmission line conductors and to provide access for construction equipment, trees and shrubs would be removed from the ROW. Equipment used during this ROW clearing could include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Woody debris and other vegetation would be piled and burned, chipped, or taken off-site. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance. TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, Transmission Construction Guidelines Near Streams (Appendices A, B and C), and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities (TVA 2017) would provide guidance for clearing and construction activities.

Following clearing and upgrade activities, vegetative cover on the ROW would be restored to its condition prior to construction, to the extent practicable, utilizing appropriate seed mixtures as described in A Guide for Environmental Protection and BMPs for TVA Construction and Maintenance Activities (TVA 2017). Erosion controls would remain in place until the plant communities become permanently established/stabilized. Streamside areas would be revegetated as described in Appendices A, B and C, and in TVA 2017. Native vegetation or plants with favorable growth patterns (slow growth and low mature heights) would be maintained within the ROW following construction.

2.2.3.2 Transmission Line Construction

Transmission-related Project features would be accessed using existing access roads to the extent possible. Access roads would be needed to allow vehicular access to each structure and other points along the ROW during the construction period. Typically, temporary access roads used for transmission lines are located on the ROW wherever possible and are designed to avoid severe slope conditions and minimize stream crossings. Access roads are typically about 20 ft to 25 ft wide and are surfaced with dirt, mulch, or gravel. Culverts and other drainage devices, fences, and gates are installed as necessary. Culverts may be left or removed, depending on the wishes of the landowner or applicable permit conditions. If desired by the property owner, TVA would restore new temporary access roads to previous conditions.

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage during construction. This area would be on the northeast corner of the site as shown in Figure 2-2.

Switch structures and a 3-pole transmission structure (Photo 2-3) would be installed at the junction of a new slack span line and the Colbert FP-Cherokee-Burnsville 161-kV line. At least two other 3-pole structures similar to the structure illustrated in Photo 2-3 would be installed along the remainder of the slack span line. The structures would use steel poles between 80 and 120 ft tall. Three conductors (the cables that carry the electrical current) are required to make up a single-circuit, alternating-current transmission line. Each conductor would be attached to a porcelain insulator suspended from the structure cross arm. A smaller overhead ground wire containing fiber optic communication cables would be attached to the top of the structures.

Most poles would be directly imbedded in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 ft. Normally, the holes would be backfilled with the excavated material, but, in some cases, gravel or a concrete-and-gravel mixture would be used. Poles at angles (angle points) in the transmission line would be self-supporting or require supporting screw, rock, or log-anchored guys.

Photo 2-3. Example of switch structures and associated 3-pole transmission structure at a transmission line tap point

Equipment used during the construction phase would include trucks, truck-mounted augers, and drills, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts.

Reels of conductor and OPGW would be delivered to the Site. A small rope would be pulled from structure to structure. This rope would be connected to the conductor and used to pull it down the line through pulleys suspended from the insulators from pull-points along the ROW. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys. The OPGW would be installed in a similar manner. Prior to installing the OPGW, the existing steel groundwire would be unclipped from the structures and removed using a pulley system from pull points along the ROW. The OPGW would be spliced to existing communication lines at each end of its span.

2.2.3.3 Substation Construction

The Proposed Action includes the construction of (A) one on-site Project Substation owned by Muscle Shoals Solar to step up medium-voltage power to high-voltage power for subsequent transfer to TVA; and (B) one TVA-owned high-voltage Switching Station. TVA Environmental Quality Protection Specifications for Transmission Substation or Communications Construction (Appendix D) would provide guidance for clearing and construction activities. The Project Substation and Switching Station will be in close proximity to each other in the northeast corner of the Project Site. The Project Substation will combine all the AC power from the collection circuits and increase its voltage to match the voltage of the connecting transmission line. This project substation would include buses, circuit breakers, disconnect switches, and the main step-up transformer. The high-voltage TVA-owned Switching Station's specific function is to enable the facility to tap into the main transmission line through a breaker scheme of TVA's choosing (breaker-and-a-half, ring-bus, etc.), which would allow the transmission line to be isolated in either direction or allow isolation of the solar array itself from the transmission line.

The Project Substation and Switching Station would occupy less than 10 acres (Figure 2-2) and would consist of a 34.5/161-kV main transformer, multiple 161-kV and multiple 34.5-kV breakers, motor-operated and manually operated switches, a control enclosure, instrument transformers for metering, and galvanized steel support structures within an 8-foot-tall fenced enclosure. The control enclosure would measure approximately 15 ft by 45 ft and would house the protection and control equipment, metering equipment, automation relay panels, and communication equipment.

Galvanized steel would support most of the substation/switching station equipment. Concrete foundations and embedments for equipment would be installed with trenching machines, concrete trucks and pumpers, vibrators, forklifts, boom trucks, and large cranes. Above-ground and below-ground conduits from this equipment would run to the control enclosure. A station service transformer would be installed for auxiliary AC power requirements, such as operating the solar array tracker motors. Battery banks and chargers would be installed inside the enclosure to provide backup DC power. For personnel safety and equipment protection during faulted conditions, a ground grid would be installed in the area. This would consist of appropriately sized conductors meshed and buried below ground. Each piece of equipment and supporting structure within the substation would be electrically connected to the ground grid per the requirements of Institute of Electrical and Electronics Engineers (IEEE) Standard 80.

After the final voltage step-up, the Project would be interconnected to the proposed 161-kV TVA transmission line to connect to the electrical system.

2.2.3.4 Transmission Line Operation and Maintenance

Periodic inspections of transmission lines are performed by helicopter aerial surveillance after operation begins. Foot patrols or climbing inspections are also performed in order to locate damaged conductors, insulators, or structures, and to discover any abnormal conditions that might hamper the normal operation of the line or adversely affect the surrounding area. During

these inspections, the condition of vegetation within the ROW, as well as immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

TVA vegetation management standards, based on National Electrical Safety Code requirements, require a minimum vegetation clearance of 24 ft for 161-kV transmission lines. Vegetation management along the ROW would consist of the felling of danger trees adjacent to the cleared ROW (as described above in the Right-of-Way Clearing Section) and vegetation control within the cleared ROW. These activities occur on approximately 3 to 5-year cycles. TVA utilizes an integrated management approach for its ROW vegetation management that is designed to encourage low-growing plant species and discourage tall-growing plant species. A vegetation re-clearing plan is developed for the transmission line, based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing (using tractor-mounted rotary mowers) and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical mowing is not practical. Herbicides would be selectively applied by helicopter or from the ground with backpack sprayers or vehicle-mounted sprayers. Provided the current agricultural land use continues, little ROW maintenance would be required in the future.

Any herbicides used are applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the U.S. Environmental Protection Agency (EPA) are used. A list of the herbicides currently used by TVA in ROW management is presented in Appendix E. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

Other than vegetation management, little maintenance work is generally required. The transmission line structures and other components typically last several decades.

2.2.4 Operations

During operation of the Muscle Shoals Solar Project, no major physical disturbance would occur. Moving parts of the solar array would be restricted to the east-to-west facing tracking motion of the solar modules, which amounts to a movement of less than a 1 degree angle every few minutes (barely perceptible). At sunset the modules would track to a flat stow position. Otherwise, the PV modules would simply collect solar energy and transmit it to the TVA power grid. Apart from routine maintenance, periodic motor replacement, inverter air filter replacement, fence repair, vegetation control, and periodic array inspection, repairs, and maintenance, the Site would be relatively undisturbed.

Vegetation on the Site would be actively maintained to control growth and prevent overshadowing or shading of the PV panels. Muscle Shoals Solar would implement one of two potential methods of vegetation control during operations: 1) traditional mechanized landscaping using lawnmowers, string trimmers, herbicides (pre-emergent and post-emergent), etc. and/or 2) sheep grazing. Traditional trimming and mowing would be performed on an interval basis to

maintain the vegetation at a height of less than 2 ft. As an alternate method, grazing sheep could also be brought in for controlling weeds and grasses on the Site. During operations, selective use of herbicides may also be employed around structures to control vegetation. Herbicides would be applied per the EPA-approved label or by certified, licensed applicators.

Once operating, one to three regular operation and maintenance (O&M) employees would be on-site as needed for scheduled/preventative maintenance or any unscheduled maintenance or outages. Routine maintenance work would normally take place during daylight hours on weekdays. Any work that might interfere with power production may occur in the early evening hours. Should a more complex repair or O&M activity be needed, such as an inverter module replacement, additional contract employees may be brought on-site to assist.

Very little water would be required during operations. There may be an occasional need to wash panels, but for this region of the country, normal rainfall would generally be sufficient to keep the panels clean of dust. In the case of extreme weather events, such as drought, water could be trucked in for panel washing. This work would take place primarily during early morning hours or late in the day, avoiding “peak” sun/heat hours to minimize impacts to generation and minimize evaporation. A temporary crew of up to 12 people along with water trucks would be brought on-site, if necessary. Reverse Osmosis or distilled water from an off-site source, without detergents or other additives, would be utilized and applied to modules by driving up and down the rows of modules. Module washing would take place no more than twice a year and water volumes would be so minimal that runoff is not expected to be generated by the washing process.

In addition to on-site personnel, the proposed Project would be monitored remotely from the Muscle Shoals Solar operational headquarters on a 24-hour a day, seven day a week basis to identify any security or operational issues. In the event a problem is discovered during non-working hours, a repair crew or law enforcement personnel would be contacted if an immediate response is warranted.

2.2.5 Decommissioning and Reclamation

The Proposed Action would operate and sell power under a PPA with TVA for the first 20 years of its life. At the end of the useful life, Muscle Shoals Solar would assess whether to cease operations at the Project Site or replace equipment and attempt to enter into a new power purchase contract or other arrangement. If TVA or another entity is willing to enter into such an agreement, the Project could continue operating. If no commercial arrangement is possible, and if TVA opts not to exercise their option for purchase at the end of the 20-year term, the facilities would be decommissioned and dismantled and the Project Site restored. In general, the majority of decommissioned equipment and materials would be recycled. Key components, including the Series 6 solar modules (or functional equivalent) to be used by Muscle Shoals Solar, realize high recycling rates at the component supplier’s state-of-the-art recycling facilities. With respect to the Series 6 solar modules (or functional equivalent), up to 90 percent of the semiconductor material can be reused in new modules and 90 percent of the glass can be reused in new glass products.

Materials that cannot be recycled would be disposed of at approved facilities.

General decommissioning and reclamation activities are described below. Decommissioning activities would typically include:

- Dismantling and removal of above ground equipment (solar panels, panel supports, transformers, Project Substations, etc.);
- Removal of below ground electrical connections;
- Removal of posts;
- Break-up and removal of concrete pads and foundations;
- Abandonment of underground utilities;
- Stabilization of site soils per NPDES construction permit (if required for decommissioning activities); and
- Scarification of compacted areas within and contiguous to the solar facility.

2.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

In determining the suitability for development of a site within TVA's service area that would meet the goals of expanding TVA's renewable energy portfolio as expressed in the 2015 IRP and meet customer demand, multiple factors were considered to screen potential locations and ultimately eliminate those sites that did not provide the necessary attributes. This process of review and refinement ultimately led to the consideration of the current Project Site. The alternative site screening process consisted of several iterations of refinement prior to arriving at the proposed site (Figure 2-4).

	Muscle Shoals	Site #2	Site #3
Iteration 1			
Solar resource screen	●	●	●
Flat landscape	●	●	●
Contiguous	●	●	●
Geology for construction suitability (minimal floodplains or forested/wetland areas)	●	●	●
Ability to avoid/minimize impacts to known sensitive biological, visual and cultural resources	●	●	●
Iteration 2			
Capability of existing electrical transmission system to support project without material network upgrades	●	●	●
Beneficially positioned on TVA's transmission system for this RFP	●	●	●
Iteration 3			
Suitability after desktop mapping of wetlands and other environmental features	●	●	●
Cost of Land	●	●	●
Timeline to secure land control	●	●	●
Interconnection timing requirements suitable for development schedule	●	●	●

Figure 2-4. Alternative Site Screening Process

Iteration one consisted of general solar resource screening within TVA's service area. In addition, further screening consisted of identifying suitable large-scale landscape features that would allow for utility scale solar development, such as areas with the following characteristics:

- Generally flat landscape with minimal slope, with preference given to disturbed contiguous land with no on-site infrastructure or existing tall infrastructure in the immediate vicinity;
- Land having sound geology for construction suitability, lacking floodplains or large forested or wetland areas; and
- Ability to avoid and/or minimize impacts to known sensitive biological, visual and cultural resources.

The second iteration of the alternative site screening process consisted of evaluation of the existing electrical transmission system and the capability of supporting the development of a large-scale solar power facility. Areas with nearby loads, planned large reductions in generating capacity or a combination of the two were incorporated into the expectation for transmission system suitability.

Iteration three consisted of desktop mapping of wetlands and other environmental features to evaluate suitability of the land within the already refined areas. Areas with large wetlands and other environmental features would involve additional impacts and require additional costs to successfully develop, and therefore, such areas were eliminated. After this refinement, land ownership was evaluated to determine the level of cost and the timeline required to secure the necessary site. Sites with a single or few landowners were generally favored over those with many. Additionally, landowner contact information was collected and initial interest gauged through telephone calls and email conversations.

The list of candidate sites for the final project siting was ultimately narrowed down to three sites, Muscle Shoals, Site #2 and Site #3, based on the above-mentioned criteria. Site #2 and Site #3 consist of over 3,000 acres and 1,500 acres of agricultural land, respectively. Both projects' sizes were comparable to that of Muscle Shoals.

Analyses were performed on all sites to identify high-level development and permitting constraints. These included identification of known environmentally-sensitive resources and potential land use or zoning conflicts. Separately, a preliminary review of the transmission systems to which the Project at each location would interconnect was conducted. It was determined that the transmission system would not be capable of supporting Site #2 without major technical upgrades, which could not be completed in time for the target commercial operation date of the Project. As there were no viable alternative points of interconnection available in the area, Site #2 was deemed unsuitable for development for this opportunity.

Since location on TVA's transmission system played an important role for this opportunity, Site #3 was ruled out of contention due to Muscle Shoals' more advantageous positioning. Therefore, Sites #2 and #3 were eliminated from further consideration either due to the extent of

transmission system improvements necessary, which would make it impossible to meet the target commercial operation, or the distance from the customer's load. The list of candidate sites for the final Project siting was ultimately narrowed down to the Muscle Shoals Project Site.

2.4 COMPARISON OF ALTERNATIVES

Due to the reasons listed above, it was determined that the scope of this EA evaluates the potential environmental effects that could result from implementing the No Action Alternative or the Proposed Action Alternative at the Muscle Shoals Project Site in Colbert County, Alabama. The analysis of impacts in this EA is based on the current and potential future conditions on the property and within the surrounding region. A comparison of the impacts of the alternatives is provided in Table 2-1.

Table 2-1. Comparisons of Impacts by Alternatives

Resource Area	Impacts from the No Action Alternative (Status Quo)	Impacts from Proposed Action
Land Use	No direct impacts anticipated. Land will remain a mix of farmland and undeveloped. Indirect impacts are possible as undeveloped land may become residential or abandoned over the long term.	Minor direct adverse impacts with the Project Site. Land use on the Project Site would change from residential and agricultural to industrial. The surrounding area, however, is largely agricultural and undeveloped with some low-density residential and industrial areas, which would not change. No direct impacts within the transmission line ROW. No indirect impacts within the Project Area.
Geology, Soils, and Prime Farmland	No direct impacts anticipated. Indirect impacts to geologic and paleontological resources are possible over time as undeveloped land may be developed. Minor impacts to individual structures or portions of the Project. If current agricultural practices are continued, soils could become depleted or eroded over time. Both possibilities would result in minor soil changes on the Project Site.	Minor adverse impacts to geology and paleontology at excavation locations within the Project Site and transmission line ROW. Minor impacts to the Project Area or project related equipment associated with potential seismic activity or sinkholes. Minor adverse impacts to soils within the Project Area related to erosion and sedimentation from site construction and operation, in addition to transmission ROW upgrades and maintenance activities. Minor adverse impact to prime farmland soils within the Project Site due to conversion of 2 percent of prime farmland in Colbert County. No impacts to prime farmland soils within the transmission line ROW. No indirect impacts anticipated within the Project Area.

Table 2-1. Comparisons of Impacts by Alternatives

Resource Area	Impacts from the No Action Alternative (Status Quo)	Impacts from Proposed Action
Water Resources	No direct impacts anticipated. Indirect impacts to water resources could result due to the continuing use of the Project Site as agricultural land. Increases in erosion and sediment runoff could occur if farming practices were not maintained to prevent this. Erosion and sedimentation on-site could alter runoff patterns on the Project Site and impact downstream surface water quality. In addition, if chemical fertilizers and pesticides are continually used, impacts to groundwater may occur if the local aquifers are recharged from surface water runoff.	**Groundwater**: No direct adverse impacts anticipated. Groundwater is available in sufficient quantity and quality if any wells need to be installed to supply non-potable water for cleaning the solar arrays. Potential spills of fuels, lubricants, and other fluids during construction and maintenance would be minimized through the use of BMPs and spill prevention/response procedures. Indirect minor beneficial impacts could result from reducing fertilizer and pesticide runoff entering groundwater. Activities related to the electrical interconnection of the Project Site with the existing TVA transmission line, as well as planned upgrades to the existing line would not impact groundwater. **Surface Water:** Stream buffers (50 ft) would be maintained as a conservative avoidance measure to protect jurisdictional streams. Approximately 6,900 linear ft of non-jurisdictional stream channel would be permanently disturbed from construction. Also, during construction runoff of sediment and erosion could adversely impact surface water quality. With the use of best management practices (BMPs), these direct adverse impacts would be minor. Indirect minor beneficial impacts could result from reducing fertilizer and pesticide runoff from the land's previous use from entering surface waters. **Floodplains:** Minor direct and indirect adverse impacts would be minimized by adhering to standard BMPs during construction as well as the Colbert County, Alabama, Flood Damage Prevention Ordinance. **Wetlands:** Minor direct adverse impact from the unavoidable loss of three isolated wetlands totaling approximately 0.73 acres**.** Minor direct adverse impacts to other on-site wetlands would be minimized with the use of BMPs including maintaining 50 ft buffers around each wetland. No indirect impacts anticipated. Upgrade/improvement activities to the existing TVA transmission line are not expected to directly impact wetlands. Adherence to TVA specifications and BMPs would minimize the potential for indirect impacts.

Table 2-1. Comparisons of Impacts by Alternatives

Resource Area	Impacts from the No Action Alternative (Status Quo)	Impacts from Proposed Action
Biological Resources	No direct impacts anticipated. Potential indirect impacts if current human practices are discontinued.	**Vegetation:** Minor temporary direct and indirect adverse impacts associated with clearing/grading of previously disturbed land. The impacts of converting approximately 1,481 acres of cropland on the Project Site to herbaceous vegetation would be relatively small and potentially beneficial with respect to the diversity and abundance of native grasses and other herbaceous vegetation that would be planted and maintained in the Project Area. A 228-acre pine plantation and an additional 147 acres of forest would be cleared and converted to herbaceous vegetation. In the ROW, maintained vegetation would be temporarily impacted in places, but would be re-established. **Wildlife:** Overall, direct impacts on wildlife in the Project Area would be minor. These impacts would be minimized by the ability of mobile species to avoid construction activities, colonize similar habitats surrounding the project area, and recolonize the project area after the completion of construction and revegetation. Indirect impacts also would be very minor as displaced wildlife would colonize similar habitats that are abundant in adjacent areas. **Rare, Threatened & Endangered (T&E) Species:** Suitable habitats for terrestrial and aquatic T&E species are either not present in the Project Area, would be avoided, and/or the use of buffers and BMPs would protect such species in the vicinity from indirect effects. Overall, no adverse impacts to federal or state-listed species are anticipated.

Table 2-1. Comparisons of Impacts by Alternatives

Resource Area	Impacts from the No Action Alternative (Status Quo)	Impacts from Proposed Action
Visual Resources	No direct or indirect impacts anticipated. Potential indirect impacts if current land use changes to residential development over time.	Due to the terrain and the large amount of agricultural land in the immediate vicinity, construction and operation of the Proposed Action would be visible from up to 1 mile away. These impacts may be mitigated with vegetative screening; For any existing occupied, residential structure within 200 ft of a solar panel where there is no existing vegetative buffer present, a vegetative buffer will be installed to create a screen for such residence. Minor temporary direct and indirect adverse impacts during construction related to vegetation removal and use of heavy equipment. Minor long term direct visual impacts in the immediate area, minor direct impacts over a larger scale due to the small number of available observers, the rolling nature of the topography, and intervening vegetation which would act as a visual screen.
Noise	No direct or indirect impacts anticipated. Potential indirect impacts if current land use changes to residential development over time.	Minor temporary direct and indirect adverse impacts during construction. Negligible adverse impacts associated with operation.
Air Quality and Greenhouse Gas Emissions	No direct or indirect impacts anticipated.	Minor temporary adverse impacts during construction. Minor beneficial impacts from operation due to a potential decrease in overall pollutant emissions.
Cultural Resources	Minor direct impacts. No indirect impacts anticipated.	No direct or indirect impacts anticipated because culturally sensitive areas would be avoided.
Natural Areas and Recreation	No direct or indirect impacts anticipated.	No direct or indirect impacts anticipated.
Utilities	No direct or indirect impacts anticipated.	No direct or indirect adverse impacts anticipated.
Waste Management	No direct or indirect impacts anticipated.	No significant direct or indirect adverse impacts anticipated with the use of BMPs.
Public and Occupational Health and Safety	No direct or indirect impacts anticipated.	With mitigation, minor temporary adverse impacts during construction of the Proposed Action, including transmission ROW work. No indirect impacts.

Table 2-1. Comparisons of Impacts by Alternatives

Resource Area	Impacts from the No Action Alternative (Status Quo)	Impacts from Proposed Action
Transportation	No direct or indirect impacts anticipated.	With mitigation, minor temporary direct adverse impacts during construction of the Proposed Action, including transmission ROW work. No indirect impacts anticipated.
Socioeconomics	No direct or indirect impacts anticipated.	Minor beneficial and long-term direct impacts from construction and operation of the Project. The local tax base would increase from construction of the solar facility and would be most beneficial to the Colbert County area.
Environmental Justice	No direct or indirect impacts anticipated.	No direct or indirect impacts anticipated.

2.5 THE PREFERRED ALTERNATIVE

The TVA-preferred alternative for fulfilling the purpose and need for this Project is the Proposed Action Alternative. The Preferred Alternative (Proposed Action) would produce renewable energy for TVA and its customers with only minor direct and indirect environmental impacts, would help meet TVA's renewable energy goals, and would help TVA meet customer driven energy demands on the TVA system.

CHAPTER 3

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing environmental, social, and economic conditions of the proposed Project Site and the surrounding areas that might be affected if the No Action Alternative or Proposed Action are implemented. This chapter also describes the potential environmental effects that could result from implementing the No Action or Proposed Action Alternative.

3.1 LAND USE

This section describes an overview of the existing land use at and surrounding the Project Area and potential impacts to land use associated with the No Action and Proposed Action alternatives. The Project Area is located in Colbert County, Alabama. The town of Cherokee is located approximately 3 miles to the west and the unincorporated community of Barton is located just to the east of the Project Site along U.S. Highway 72 (Figure 1-1). The Project Area is part of the Florence-Muscle Shoals metropolitan area known as "The Shoals."

3.1.1 Affected Environment – Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Many municipalities develop zoning ordinances and planning documents to control the direction of development and to keep similar land uses together. The Project Area is not located within city or town limits, but rather in an unincorporated part of Colbert County; there are no specific zoning ordinances in rural Colbert County. The closest area which has a written comprehensive development plan is the City of Tuscumbia, located approximately 10 miles east of the Project Site (Figure 1-1). Land use on the Project Area is not officially governed by a municipality.

The National Land Cover database classifications show the Project Site as agricultural land, primarily cultivated crops with areas of hay/pasture land, and small areas of pine plantation (Figure 3.1-1). The Project Site consists of gently rolling terrain with small hills and depressions across the Project Site, and ranges in elevation from approximately 500 to 550 ft above mean sea level (msl). Agricultural crops are dominated with planted wheat, soybeans, cotton, or corn. Several small stands of shrubs and trees are present across the Project Site. Mulberry Creek flows adjacent to the eastern boundary of the Project Site and within the southern portion of the property. Several roughly circular or oval depressions were identified in various locations around the Project Site, including Mississippi Pond and Williams Pond located in the central portion of the Project Site; however, many of these depressions do not appear to contain water year-round based on a review of current and historic aerial imagery.

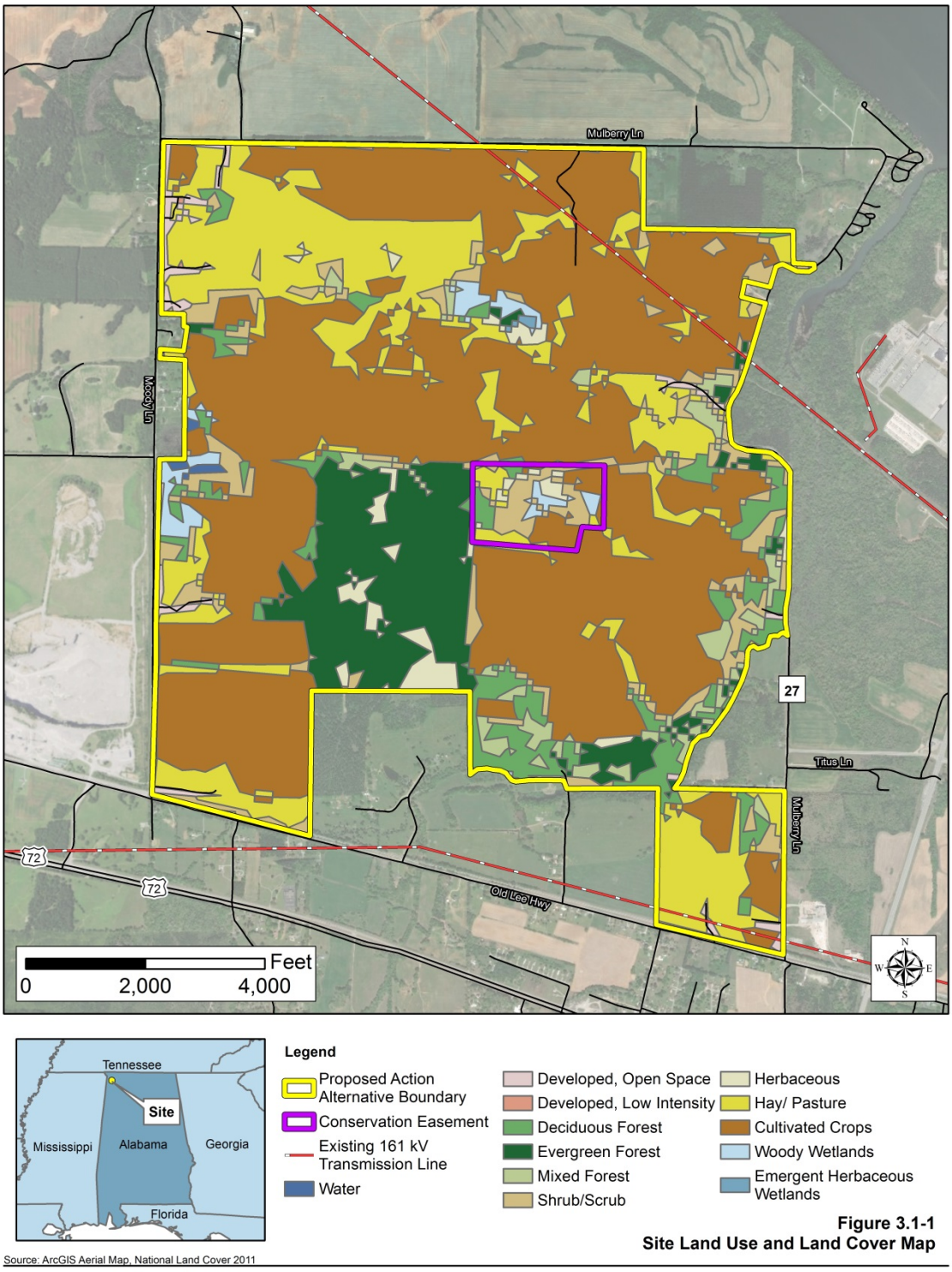


Figure 3.1-1. Site Land Use and Land Cover Map

Very little of the Project Site is developed, though residential structures and farm buildings are present in certain areas. For parcels containing existing structures that are acquired for the Project, it would be expected that most structures would be relocated or demolished; however, the potential exists for some residences, particularly those close to the county road, to ultimately be excluded from the Project Site. Additional residential structures and farms surround the Project Site on all sides.

Land use in the vicinity of the Project Area is also primarily agricultural (cultivated crops, hay/pasture). Some low-density residential development is located west of the Project Site, closer to the town of Cherokee and additional residences are located adjacent to the northeast corner of the Project Site near the Tennessee River. There are numerous nearby industrial developments. Vulcan Materials Company operates a large quarry along Old Lee Highway near the southwest corner of the Project Site. Recycling Management Resources operates a paper recycling facility at the former UCM Magnesia facility, located across from the southeast corner of the Project Site. The Barton Riverfront Industrial Park is within 1 mile of the Project Site's eastern boundary and includes two industrial plants: paper products manufacturer SCA Tissue North America and the railcar manufacturer Freightcar America. Cherokee Nitrogen produces ammonia and other chemicals at a facility less than 2 miles north of the Project Site. Additionally, TVA's Colbert Combustion Turbine facilities are located adjacent to the transmission ROW to the northeast of the Project Site

3.1.2 Environmental Consequences – Land Use

This section describes the potential impacts to land use should the Proposed Action or No Action Alternatives be implemented.

3.1.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line upgrades would not be constructed; therefore, no project-related impacts to land use would result. Existing land use would be expected to remain a mix of farmland and undeveloped land.

Indirect impacts to land use are possible as growth occurs within the town of Cherokee and the community of Barton. Over time, it is possible that the agricultural areas on the Project Site could be developed if the resident population in the area grows significantly. Additionally, if the agricultural activities on the Project Site are discontinued, land could revert to undeveloped property. Indirect impacts to land use are possible under the No Action Alternative as agricultural land may become residential or abandoned over the long term.

3.1.2.2 Proposed Action

Under the Proposed Action, impacts to land use would be expected on the Project Site; no impacts would be anticipated in the transmission line ROW as land use within the corridor would not change. Land use on the Project Site would be converted from agricultural and residential to industrial. Figure 2-2 shows the Proposed Project layout of the solar array and associated facilities; Figure 2-3 shows the proposed ground disturbance (both temporary and permanent)

and exclusion areas. Within the Project Site, jurisdictional streams and wetlands, the existing conservation easement, and culturally-sensitive areas would be avoided. The construction and maintenance of the Project transmission-related features would also require access roads capable of supporting heavy equipment (discussed in Section 2.2.3.2). Additionally, a new route to access the conservation easement would be established in a manner similar to that shown in Figure 2-2.

The surrounding area is largely agricultural and undeveloped with some low-density residential and industrial development, which is not likely to change significantly over the next 20 years. As a relatively small portion of a very large land use category in the vicinity would be lost, the Proposed Action would have an overall minor adverse impact. Decommissioning of the solar facility would remove above ground equipment, concrete pads and foundations, posts, and below ground electrical connections from the Project Site. Some underground utilities may be abandoned in place. Reclamation activities, including breaking up soil compacted areas, could allow a large portion of the Project Site to be returned to agricultural use. The activities associated with the Proposed Action would not have any indirect effects on land use within either the Project Site or the transmission line ROW.

3.2 GEOLOGY, SOILS AND PRIME FARMLAND

The existing geological resources within the Project Site and the potential impacts on these geological resources associated with the No Action and Proposed Action alternatives are discussed in this section. Geological resources analyzed include geology, paleontology, geologic hazards, soils, and prime farmland.

3.2.1 Affected Environment – Geology, Soils and Prime Farmlands

3.2.1.1 Geology

The Project Area is located in Colbert County, Alabama, near the southern edge of the Interior Low Plateaus geographic province. This province extends from northern Alabama to southern Illinois, Indiana, and Ohio. There are five physiographic sections in Alabama: the Cumberland Plateau, Highland Rim, Valley and Ridge, Piedmont Upland, and East Gulf Coastal Plain. The Project Site is in the Highland Rim section, which is comprised of three smaller districts: the Tennessee Valley, the Little Mountain, and the Moulton Valley districts. The Project Area is in the Tennessee Valley district in an area characterized by plateaus of moderate relief varying between 450 ft above msl and 600 ft above msl (Encyclopedia of Alabama 2019, GSA 2009, GSA 2016a, GSA 2016b, GSA 2018, and USGS 1988).

As shown in Figure 3.2-1, the Site is primarily underlain by Tuscumbia Limestone with a small area to the south underlain by the Pride Mountain Formation. The dominant stratigraphy in this area consists of Tuscumbia Limestone, a fine to coarse-grained, light-gray limestone, partly oolitic near the top with crinoidal limestone and chert scattered throughout. The Pride Mountain Formation is a medium to dark-gray shale containing thin beds of limestone and sandstone, with occasional interbeds of mudstone (USGS 1962, GSA 2009, and USGS 2019).

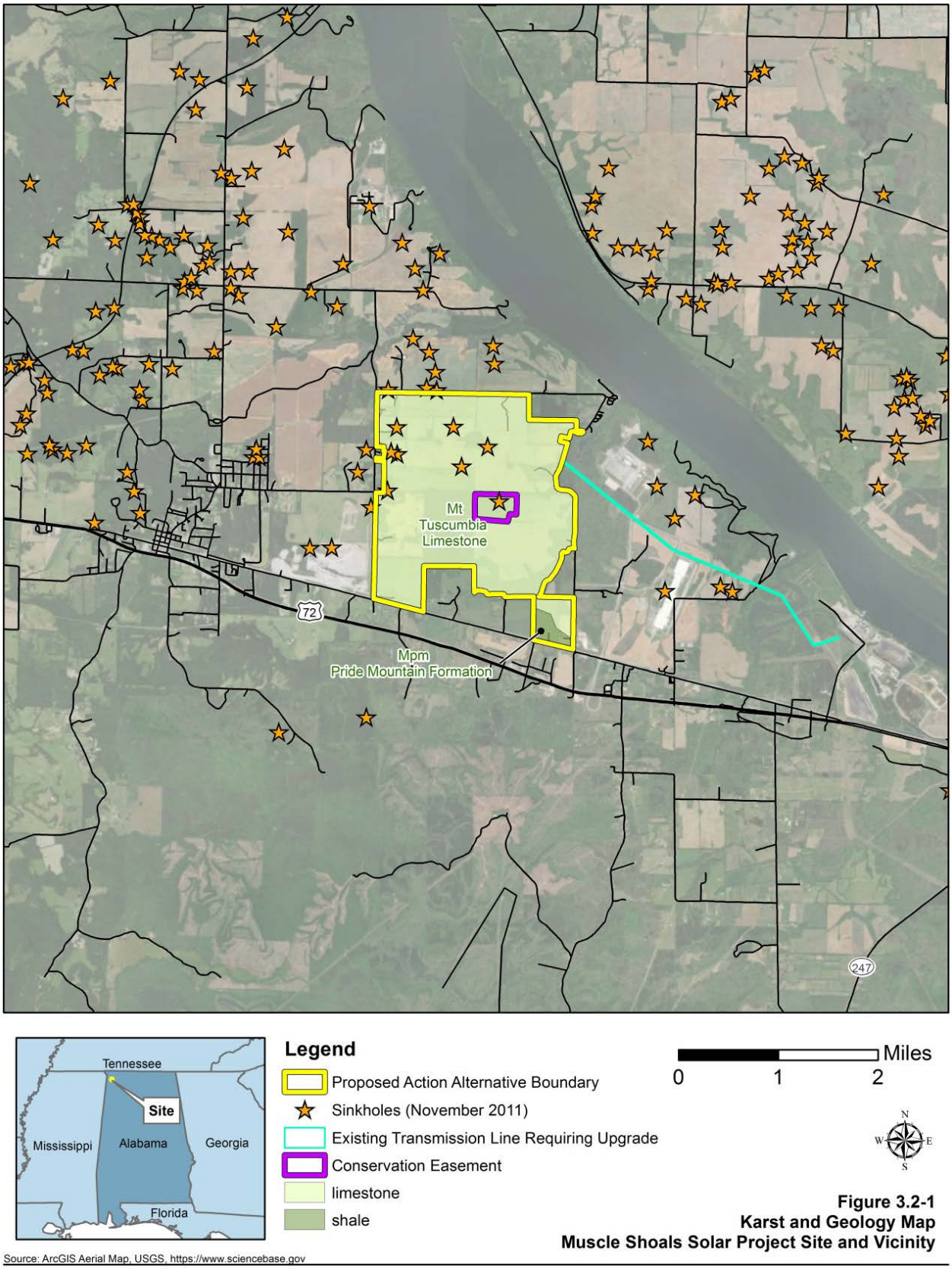


Figure 3.2-1. Karst and Geology Map

3.2.1.2 Paleontology

Significant paleontological resources are present in Alabama and are potentially present beneath the Project Site. Life was abundant in the semi-tropical, warm, salty ancient sea and an abundance of marine fossils, along with some land-based fossils, are found within the sedimentary layers. Fossils are known to be present within the Tuscumbia Formation. It is unknown whether fossil remains are present within the Project Area boundary.

3.2.1.3 Geological Hazards

Geological hazards include landslides, volcanoes, earthquakes/seismic activity, and subsidence/sinkholes. Conditions do not exist in the proposed Project Area for a majority of these types of hazards. The Project Area is located on relatively level ground and no significant slopes are present within several miles of the Project Area; therefore, landslides are not a potential risk. There are no volcanoes within several hundred miles of the proposed Project Site (USGS 2019).

However, Tuscumbia Limestone is prone to karst terrain and comprises the uppermost geologic unit underlying the majority of the Project Area (USGS 2019). Karst terrain is topography with distinctive landforms and hydrology created by the dissolution of limestone and dolomite layers. Springs, caves, and sinkholes are all distinctive features of karst terrain. The size and extent of any karst feature is dependent on the geological and hydrological characteristics of the specific site. Karst terrain can be found throughout Colbert County and within the Project Area (Kuniansky et al. 2016, Weary 2014, AEMA 2014, and Figure 3.2-1). The presence of on-site karst terrain would not be anticipated to cause an adverse impact to geology. The development of karst features under individual arrays could cause damage to those specific arrays but would not have significant impacts on the surrounding area.

In addition, seismic activity could cause surface faulting, ground motion, ground deformation, and conditions including liquefaction and subsidence at various places within the Project Area. The Modified Mercalli Scale is used within the US to measure the intensity of an earthquake. The scale arbitrarily quantifies the effects of an earthquake based on the observed effects on people and the natural and built environment. Mercalli intensities are measured on a scale of I through XII, with I denoting the weakest intensity and XII denoting the strongest intensity. The lower degrees of the scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. This value is translated into a peak horizontal ground acceleration (PGA) value to measure the maximum force experienced. The PGA is the maximum acceleration experienced by a building or object at ground level during an earthquake on uniform, firm-rock site conditions. The PGA is measured in terms of percent of “g,” the acceleration due to gravity. The U.S. Geological Survey (USGS) Earthquake Hazards Program publishes seismic hazard map data layers that display the PGA with 10 percent (1 in 500-year event) probability of exceedance in 50 years. The site is southeast of the New Madrid seismic zone in the Mississippi Embayment Area of Arkansas, Kentucky, Missouri, and Tennessee. The site is also west of a less active zone, the Southern Appalachians seismic zone, stretching from northeast Alabama through Tennessee and

Virginia. The potential ground motion for the proposed Project Site ranges from 0.05 to 0.07 g, for a PGA, with a 10 percent probability of exceedance within 50 years (USGS 2014, AEMA 2014, and Figure 3.2-2).

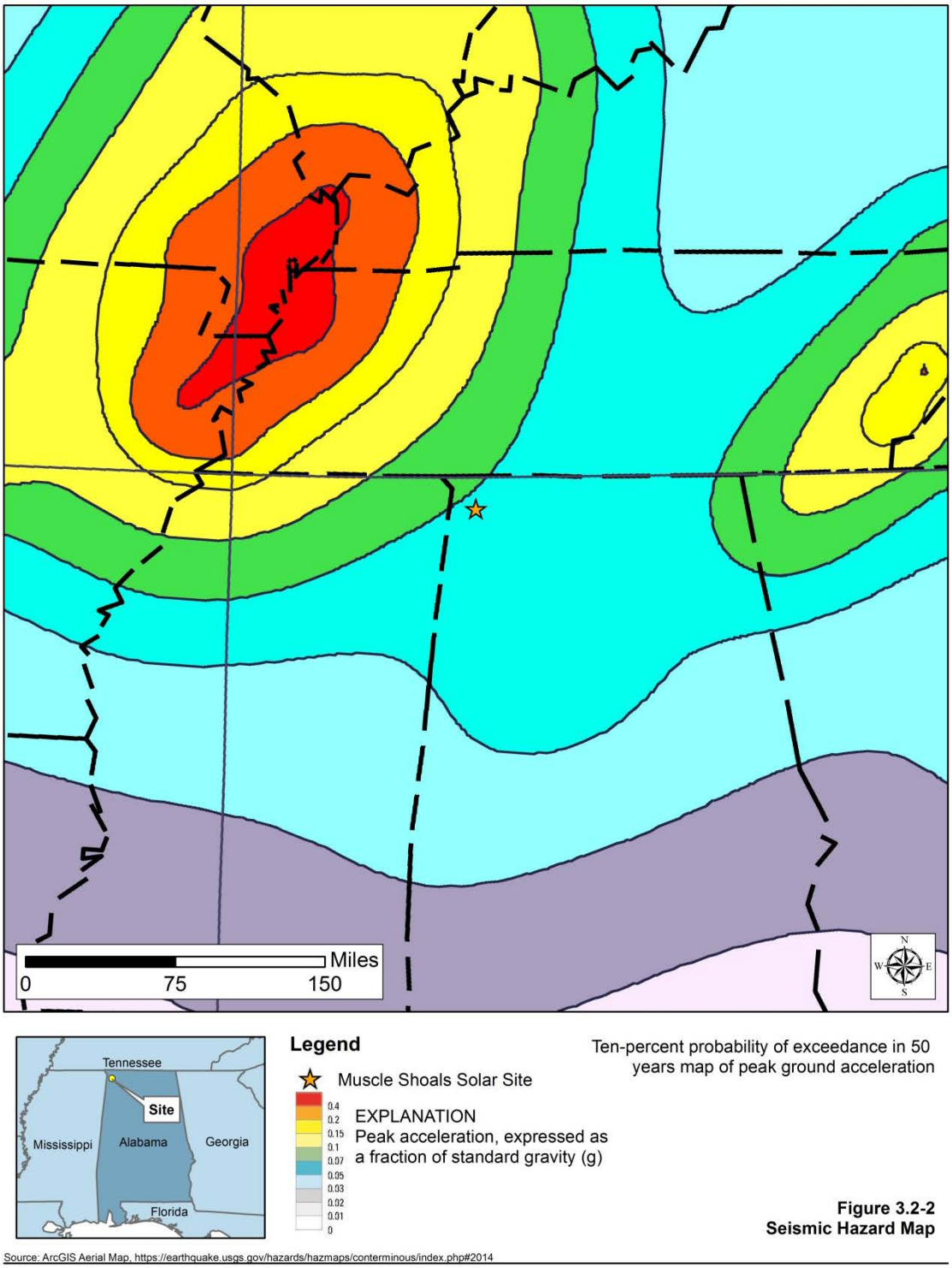


Figure 3.2-2. Seismic Hazard Map

3.2.1.4 Soils

The soil types within the Project Area are shown on Figures 3.2-3 and 3.2-4, and soil type occurrence within both the Project Site and the transmission line ROW is shown in Table 3.2-1. The soils at the Project Site, listed in order of decreasing prevalence, are Decatur silt loam, Emory silt loam, Fullerton gravelly silt loam, Fullerton-Bodine complex, Pruitton and Sullivan silt loams, Decatur silty clay loam, Chenneby silt loam, Chisca loam, Tupelo-Colbert complex, and Capshaw silt loam. Decatur silt loam, Emory silt loam, Pruitton and Sullivan silt loams, Chenneby silt loam, Tupelo-Colbert complex, and Capshaw silt loam are classified as prime farmland. Additionally, the Fullerton gravelly silt loam and Decatur silty clay loam are classified as farmland of statewide importance. Only the Fullerton-Bodine complex and the Chisca loam, which occupy about 3 percent of the Project Site, are neither prime farmland nor farmland of statewide importance. Typical descriptions of these soils are below (USDA 1994, NRCS 2019).

The Decatur soil series is a deep, well-drained soil found on uplands. These gently sloping soils formed from weathered limestone. The Decatur silt loam (DaB) comprises 57 percent of the Project Site and almost 35 percent of the transmission ROW. DaB is very deep prime farmland soil with 2 to 6 percent slopes. DaB presents a reddish brown silt loam surface turning to dark reddish-brown silty-clay loam at about seven inches deep. Beyond 20 inches, the DaB subsoil is dark red clay with depth to water table beyond 80 inches. DaB is well suited to crops and pasture.

The Emory Silt Loam (EmA) is very deep, nearly flat prime farmland with 0 to 2 percent slope. Found in depressions, EmA comprises almost 23 percent of the Project Site and over 5 percent of the transmission ROW. EmA is well drained for most of the year but can be ponded for brief periods in winter and early spring. It is typically a dark reddish-brown silt loam turning to a silty clay loam beyond 52 inches. Depth to water table is about 62 inches and depth to bedrock is beyond 80 inches. EmA is suitable for crops and pasture.

The Fullerton soil series is deep, well-drained, and strongly sloped. Fullerton gravelly silt loam (FaD) is very deep farmland of statewide importance with 6 to 15 percent slopes. Found on ridges and side slopes, FaD comprises more than 12 percent of the Project Site and almost 27 percent of the transmission ROW. FaD is typically brown chert silt loam at the surface turning to red gravelly silty clay beyond 6 inches, with depth to bedrock or the water table beyond 80 inches deep.

The Fullerton-Bodine complex (FbF) consists of very deep, very well drained, and even excessively drained mixtures of Fullerton (45 percent), Bodine (35 percent), and other soils with 15 to 45 percent slopes. FbF comprises almost 3 percent of the Project Site and almost 10 percent of the transmission ROW, with depth to bedrock and water table beyond 60 inches. The Fullerton component is found on high hills and slopes. Fullerton is characterized by brown cherty silt loam transitioning to gravelly clay beyond 6 inches. The Bodine component is found on mountain slopes, exhibiting dark grayish brown cherty silt loam transitioning to red cherty silty clay loam beyond 12 inches. While FbF is not suited to crops, it is suited to loblolly pine production. FbF is not prime farmland or farmland of statewide importance.

The Pruitton and Sullivan silt loams (PUA) is considered prime farmland, is often used for cultivated crops, and comprises almost 2 percent of the Project Site and almost 5 percent of the transmission ROW. PUA are found on flood plains and are occasionally flooded. PUA exhibits 0 to 2 percent slopes with a typical composition of 45 percent Pruitton soils and 40 percent Sullivan soils. These very deep, well drained brown silt loam soils typically exhibit a depth to water table of more than 48 inches and a depth to bedrock of more than 80 inches.

Decatur silty clay loam (DaC2) is very deep farmland of statewide importance with 6 to 10 percent slope, eroded. DaC2 comprises almost 1 percent of the Project Site and is not present in the transmission ROW. DaC2 is typically a dark reddish-brown silty clay loam turning to dark red silty clay beyond four inches, with depth to bedrock or water table beyond 80 inches. DaC2 is well suited to crops and pasture.

The Chenneby silt loam (CeA) is considered prime farmland and comprises almost 1 percent of the Project Site and is not present in the transmission ROW. CeA is a very deep, somewhat poorly drained soil found in depressions. It exhibits 0 to 2 percent slopes and may remain ponded for long periods of time. Typically, brown silt loam transitions to gray silty clay loam beyond 8 inches with depth to the water table between 0 to 18 inches and depth to bedrock beyond 80 inches. CeA is often used for hardwood and can be used for corn, soybeans, and hay.

Chisca loam (ChD) is a deep, well-drained soil found on ridges. ChD exhibits 6 to 15 percent slopes with 40 to 60 inches to paralithic bedrock and more than 80 inches to the water table. ChD is typically brown loam transitioning to red and brown clay beyond 5 inches deep. ChD is primarily used as woodland and pasture. ChD is not prime farmland or farmland of statewide importance, and comprises less than 1 percent of the Project Site and is not present in the transmission ROW.

The Tupelo-Colbert complex (TuB) soils are suited to pasture, are considered prime farmland, and comprise less than 0.1 percent of the Project Site and is not present in the transmission ROW. TuB consists of poorly to moderately drained, deep and very deep soils exhibiting 0 to 4 percent slopes. TuB is an intricate mixture of Tupelo (55 percent) and Colbert (35 percent) soils. The Tupelo soils are brown silt loam transitioning to clay loam beyond 7 inches with depth to water table between 12 and 24 inches and more than 80 inches to bedrock. While Tupelo loam is found on upland flats, the Colbert loam is found on ridges. Colbert is a brown silt loam transitioning to silty clay beyond 8 inches and finally to clay beyond 26 inches deep. Unlike Tupelo soils, Colbert soils have a depth to water table of about 40 inches with depth to bedrock between 40 to 72 inches.

Capshaw silt loam (CaB) is considered prime farmland and comprises less than 0.1 percent of the Project Site and is not present in the transmission ROW. CaB is a deep, well-drained soil exhibiting 2 to 6 percent slopes. CaB is found on ridges and side slopes, has a depth to water table between 20 to 30 inches, and has a depth to bedrock of greater than 80 inches. Typically, dark brown silt loam transitions to silty clay loam beyond 8 inches and finally to silty clay beyond 20 inches in depth.

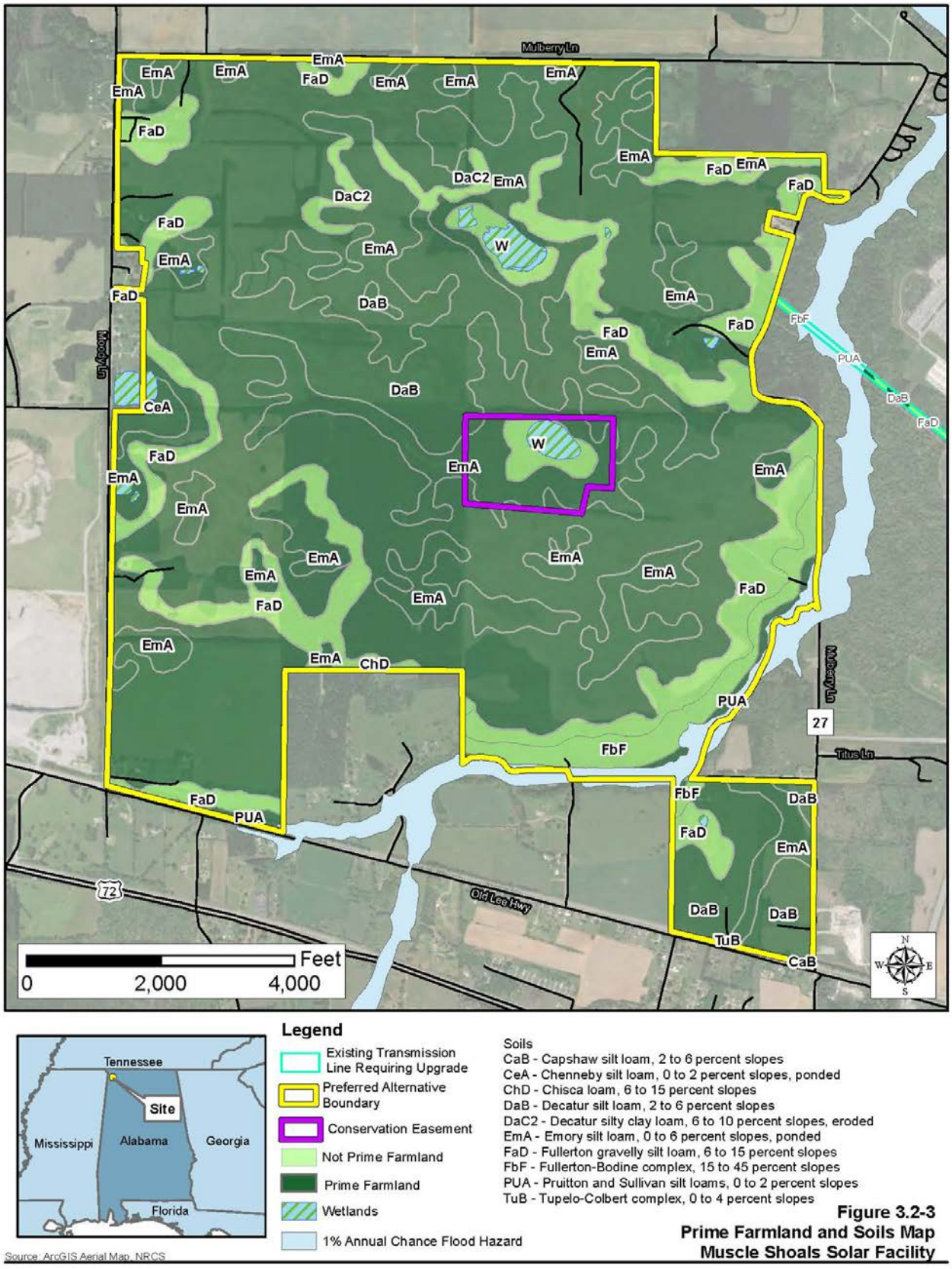


Figure 3.2-3. Prime Farmland and Soils Map

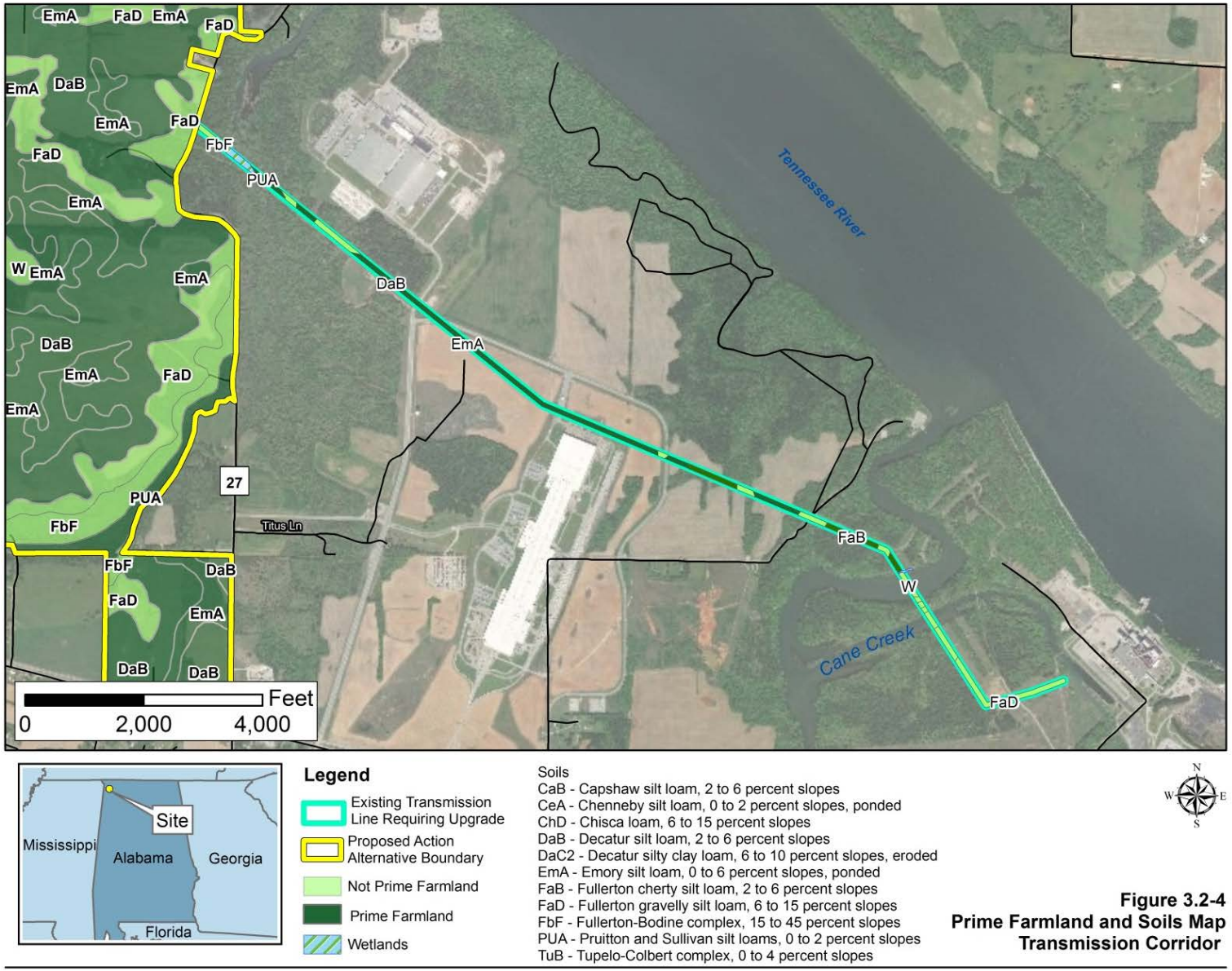


Figure 3.2-4. Prime Farmland and Soils Map Transmission ROW

Table 3.2-1. Soil Type Occurrence on the Project Site

Soil Type	Acreage in Transmission ROW	Acreage on Project Site (percent [%])	Total Acres	Acreage on the Site Permanently / Temporarily Disturbed	Prime Farmland?	Farmland of Statewide Importance?
Decatur silt loam (DaB)	14.4 (34.5%)	1385.7 (57.0%)	1399.3	1250.6 / 0.9	Yes	Yes
Emory silt loam (EmA)	2.2 (5.3%)	551.7 (22.7%)	555.0	454.4 / 0.0	Yes	Yes
Fullerton gravelly silt loam (FaD)	11.2 (26.9%)	306.5 (12.6%)	316.5	195.7 / 1.9	No	Yes
Fullerton-Bodine complex (FbF)	4.1 (9.8%)	68.0 (2.8%)	72.2	2.2 / 0.0	No	No
Pruitton and Sullivan silt loams (PUA)	2.0 (4.8%)	35.8 (1.5%)	37.7	0 / 0	Yes	Yes
Decatur silty clay loam (DaC2)	0 (0%)	20.7 (0.9%)	20.7	20.1 / 0.0	No	Yes
Chenneby silt loam (CeA)	0 (0%)	15.1 (0.6%)	15.1	0.6 / 0.0	Yes	Yes
Chisca loam (ChD)	0 (0%)	4.5 (0.2%)	4.5	2.8 / 0	No	No
Tupelo-Colbert complex (TuB)	0 (0%)	0.9 (<0.1%)	0.9	0 / 0	Yes	Yes
Capshaw silt loam (CaB)	0 (0%)	0.4 (<0.1%)	0.4	0.1 / 0.0	Yes	Yes
Fullerton cherty silt loam (FaB)	5.7 (13.7%)	0 (0%)	5.4	0 / 0	Yes	Yes
Water	2.1 (5.0%)	42.2 (1.7%)	44.0	0.4 / 0.0	Not Applicable	Not Applicable
Total Acres	41.7	2431.5	2471.8	1927.01 / 2.8	2013.9	2351.1
Totals within Transmission ROW Only				Unknown	24.3	35.5
Totals within Project Site Only				1927.0 / 2.8	1989.5	2316.8
Totals within Project Site Disturbed					1705.8	1921.6

As shown in Table 3.2-1, most of the soil types present within the transmission ROW are also found within the Project Site; Fullerton cherty silt loam (FaB) is the only soil type within the transmission ROW which was determined not to occur within the Project Site boundary. FaB is very deep prime farmland with 2 to 6 percent slopes. This well drained, gently sloping soil is found on ridges, FaB comprises almost 14 percent of the transmission ROW. FaB is typically brown cherty silt loam at the surface turning to red cherty silty clay at 6 inches and to red cherty clay beyond 25 inches, with depth to bedrock or the water table beyond 60 inches deep (USDA 1994, NRCS 2019).

3.2.1.5 Prime Farmland

Prime farmland is land most suitable for economically producing sustained high yields of food, feed, fiber, forage, and oilseed crops. Prime farmlands are available for agricultural use, i.e., not water or urban built-up land, and have the best combination of soil type, growing season, and moisture supply. Farmland of statewide importance is not federally recognized prime farmland, but land that is important in the production of food, feed, fiber, forage, and oil seed crops. Individual states delineate their own important farmland (NRCS 2019).

As shown in Table 3.2-1, seven of the Site and transmission line soils, the Decatur silt loam, Emory silt loam, Pruitton and Sullivan silt loams, Chenneby silt loam, Tupelo-Colbert complex, Capshaw silt loam and Fullerton cherty silt loam, are classified as prime farmland. Additionally, the Fullerton gravelly silt loam and Decatur silty clay loam are classified as farmland of statewide importance. Only the Fullerton-Bodine complex and the Chisca loam, which occupy about 3 percent of the Project Site, are neither prime farmland nor farmland of statewide importance. The locations of prime farmland soils on both the Project Site and the transmission ROW are identified on Figures 3.2-3 and 3.2-4, respectively.

Table 3.2-2 provides a summary of farming in Colbert County and overall in the State of Alabama for comparison. In addition, changes in the number and acreage of farms from 2007 to 2012 are also included (USDA 2014).

The Farmland Protection Policy Act (FPPA], 7 U.S.C.§ 4201 *et seq.*), requires Federal agencies to consider the adverse effects of their actions on prime or unique farmlands. The purpose of the Act is "to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses."

Table 3.2-2. Farming Statistics for Colbert County, Alabama

	Number of Farms	Percentage of Total Area in Farms	Land in Farms (Acres)	Change from 2007 to 2012	
				Number of Farms	Land in Farms (Acres)
Colbert County	687	40.3	152,767	-49	+23,862
Alabama	43,223	26.5	8,902,654	-5,530	-130,883

Source: USDA 2014

3.2.2 Environmental Consequences – Geology, Soils and Prime Farmlands

This section describes the potential impacts to geology, paleontology, geologic hazards, soils, and prime farmland should the Proposed Action or No Action Alternatives be implemented.

3.2.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line upgrades would not be constructed; therefore, no direct or indirect Project related impacts on geological, paleontological, soil resources, or prime farmlands would result, and there would be no risk to Project components from on-site geologic hazards. Existing land use would be expected to remain a mix of farmland and undeveloped land.

Over time, indirect impacts to soils and geology could occur if the current land use practices are abandoned. If the Site were to be developed, changes to the soils on-site would occur. Conversely, if agricultural practices were continued, soils could eventually become depleted in nutrients or erode, resulting in minor changes on the Project Site. Seismic activity or sinkholes could affect structures or isolated portions of the Project Area.

3.2.2.2 Proposed Action

Under the Proposed Action, construction and operation of the Project (including transmission line upgrades and maintenance activities within the transmission ROW) would be anticipated to result in minor direct impacts to geology and soil resources by contributing to erosion and sedimentation, and in the conversion of approximately 2 percent of Colbert County's prime farmland. Approximately 1,927 acres would be cleared and potentially graded and approximately 44 acres would be temporarily disturbed; light surface preparation and tall vegetation removal would occur as needed within these 44 acres (Figure 2-3). Clearing and grading would disturb existing soil profiles and any surficial paleontological resources. Both grading and mowing would cause minor, localized increases in erosion and sedimentation. The exclusion areas, including the conservation easement, would remain undisturbed.

Geology and Paleontology

Under the Proposed Action, minor impacts to geology and paleontology could occur. The solar arrays would be supported by steel piles which would either be driven or screwed into the ground to a depth of 6 to 10 ft. The Muscle Shoals Project Substation and the Mulberry Creek Switching Station would occupy approximately 10 acres and would not require deep excavation. The four on-site detention basins (totaling approximately 14 acres) would be shallow and would utilize the existing terrain, minimizing the need for extensive excavation. The PV panels would be electrically connected using a Series 6 (or functional equivalent) dual junction combiner box, which would feed the block PCS. The PCS would then feed the transformer, which would route to the Project Substation. The voltage collection circuits may either be pole mounted or direct-buried. Minor excavations would be required for each block PCS and associated transformers. An on-site Project Substation along with upgrades to the existing transmission line would connect the blocks of arrays to the TVA transmission system. Due to the small subsurface disturbance, only minor direct impacts to potential subsurface geological and paleontological resources are anticipated within the Project Site and the transmission line ROW. No indirect impacts to geological and paleontological resources are anticipated in either the Project Site or the transmission line ROW.

As no significant excavation would be required, only minor direct impacts to geological and paleontological resources would be anticipated. Should paleontological resources be exposed during transmission line upgrades, site construction (i.e., grading, trenching, and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional impacts, and render a recovery plan/mitigation strategy.

Geologic Hazards

Hazards resulting from geological conditions would be minor because the Project Site is in a relatively stable geologic setting. There is a moderate probability for small to moderate intensity seismic activity. The potential for on-site sinkholes is unknown. During the detailed project design phase, the developer would evaluate the need to perform site surveys and/or geotechnical studies to identify existing karst features and determine the need for mitigation or avoidance. Either seismic activity or sinkholes would likely only cause minor impacts to the Project area and equipment on the Site. Geologic hazard impacts within the Project Area would be unlikely to impact off-site resources.

Soils

The Site preparation process may include a minimal amount of grading, in which topsoil from some areas of permanent disturbance would be removed, stockpiled, and redistributed on the Project Site (Figure 2-3). Once the Site is graded, the topsoil would be replaced prior to construction of the arrays. The topsoil under PCS blocks, their associated transformers, and the substation would not be replaced. Approximately 44 acres would be temporarily impacted during mowing and construction activities, including light surface preparation. Soils located in areas where only vegetation clearing is proposed would remain in place unless a circuit trench or foundation needed to be constructed. These acreage totals do not include the 50-ft stream/wetland buffers, conservation easement, and/or other areas necessary to leave undisturbed to protect sensitive biological or cultural resources encountered during the pre-construction stages.

The grading plan was designed to impact the least amount of soil possible, such that on-site soils would be used to fill areas that needed to be elevated per PV array design specifications. Although not anticipated, should borrow material be required, small amounts of sand and gravel aggregate may be obtained either from on-site activities or from local, existing, off-site sources. The creation of new impervious surfaces, in the form of the access roads, panel footings, and the foundations for the Project Substation and the Switching Station, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Use of BMPs such as soil erosion and sediment control measures would minimize the potential for increased soil erosion and runoff.

Due to the Project disturbance area being at least one acre, a NPDES Permit for discharges of stormwater associated with construction activities would be required. Application for the permit would require submission of a CBMPP describing the management practices that would be utilized during construction to prevent erosion and runoff along with management practices to

reduce pollutants in stormwater discharges from the Site. Following construction, implementation of soil stabilization and vegetation management measures would reduce the potential for erosion impacts during Site operations.

In addition to the soil disturbance on the Project Site, there would be minor impacts within the proposed 100-foot wide transmission line corridor (located within the 5-acre easement in the northeast corner; Figure 2-3). The existing transmission line and structures would require the potential upgrade activities discussed in Section 2.2.3. As the ROW is already cleared and access roads already present, impacts would be similar to those occurring on-site, although smaller. The total acres of disturbance are unknown at this time; however, impacts along the transmission lines would be to existing ROW areas. In the event sensitive biological resources are encountered along the ROW, such as wetlands or streams, BMPs and permit requirements would be followed during construction and post-construction periods to reduce erosion and sedimentation possibilities. The ROW would be allowed to re-vegetate or would be seeded as necessary after construction to minimize erosion and possible sedimentation. TVA would continue regular vegetation maintenance activities within the ROW following the upgrades. Planned upgrades/improvements to the existing TVA Colbert FP-Cherokee-Burnsville 161-kV transmission line (see Section 2.2.3) could potentially impact soils within the transmission ROW. Adherence to TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities (TVA 2017) would ensure that impacts of the upgrade/improvement activities on the existing transmission ROW are not significant.

During operation of the solar facility, very minor disturbance could occur to soils. Routine maintenance would include periodic tracker motor replacement, inverter air filter replacement, fence repair, and vegetation control along with periodic array inspection, repairs, and maintenance. The Project would implement traditional mechanized landscaping using lawnmowers, weed eaters, etc. to control vegetation during operations. Traditional trimming and mowing would be performed periodically to maintain the vegetation at a height of less than 2 ft. Module washing would occur no more than twice a year and would use BMPs and a CBMPP to prevent any soil erosion or stream and wetland sedimentation. Selective use of pre-emergent and post-emergent herbicides may also be employed around structures to control weeds. These maintenance activities would not result in any adverse impacts to soils on the Project Site during operations.

Prime Farmland

The acreages of prime farmland and farmland of state importance that would be impacted by the Project and associated upgrades to the existing transmission line are shown in Table 3.2-1. Should the Proposed Action be implemented, approximately 2,316.8 acres of prime farmland and farmland of statewide importance on the Project Site would be converted to nonagricultural use, precluding farming for the duration of site operations. Approximately 35.5 acres of prime farmland and farmland of statewide importance present within the transmission line ROW has already been converted, as this is an existing corridor. The entire 2,432-acre Project Site

containing predominantly prime farmland/farmland of statewide importance would be converted to a developed solar power facility. Within the Project Site, a total of approximately 1,927.0 acres would be permanently disturbed and 2.8 acres temporarily disturbed by the Preferred Alternative. Prime farmland and farmland of statewide importance encompass 1,921.6 acres of the 1,927.0 acres of potential permanent disturbance and are not present in the area of temporary disturbance. Activities within the proposed area of permanent disturbance would result in the loss of some farmland soils through grading and excavation activities; however, the majority of on-site soils would remain in place. During operations, soils would have an opportunity to develop in place with minimal ground disturbance. In the event that the solar facility would be decommissioned and reclaimed in the future, the prime farmland could potentially be used again for agricultural purposes with no anticipated long-term loss of soil productivity on most of the Project Site. In fact, in areas where soil had become depleted, it is possible there could be a certain degree of soil regeneration.

To quantify the potential impacts on prime farmland soils at the Muscle Shoals Site, TVA submitted Form AD-1006, Farmland Conversion Impact Rating, and initiated consultation with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in a letter dated May 1, 2019 and the NRCS response was received on May 13, 2019 (Appendix F). The impact rating for the proposed Project Site is 206. Projects with total impact rating scores below the threshold value of 160 do not require further consideration under the FPPA. For projects with scores greater than or equal to 160, the FPPA does not require federal agencies to alter projects to avoid or minimize farmland conversion. However, for such projects, agency personnel are required to consider:

- Use of land that is not farmland or use of existing facilities;
- Alternative sites, locations, and designs that would serve the proposed purpose but convert either fewer acres of farmland or other farmland that has a lower relative value; and
- Special siting requirements of the proposed project and the extent to which an alternative site fails to satisfy the special siting requirements as well as the originally selected site.

As described in Section 2.3, other sites were evaluated as potential locations for the proposed action. These sites were eliminated from further consideration due to transmission system improvements that would delay the timeline and distance from the customer's load. The Project would convert a total of approximately 2 percent of prime farmland in Colbert County, Alabama to non-agricultural use. Following decommissioning of the solar facility, the majority of the Site could potentially be returned to agricultural use with little reduction in soil productivity or impact to prime farmland/farmland of statewide importance. Therefore, adverse impacts of this minor and reversible conversion of prime farmland would not be significant. Indirect impacts to prime farmland associated with the proposed actions would not be anticipated.

3.3 WATER RESOURCES

This section describes an overview of existing water resources within the Project Area and the potential impacts on these water resources that would be associated with the Proposed Action. Components of water resources that are analyzed include groundwater, surface water, floodplains, and wetlands.

3.3.1 Affected Environment – Water Resources

3.3.1.1 Groundwater

Groundwater is water located beneath the ground surface, within soils and rock formations. A rock unit that has sufficient permeability to conduct groundwater and to allow economically significant quantities of water to be produced by man-made water wells and natural springs is known as an aquifer. To be productive, the aquifer must be permeable and porous and retain qualities that allow water to flow through it easily. Sandstones, conglomerates, and fractured rocks can often be productive aquifers.

The Tennessee River watershed includes all or parts of 15 counties in north Alabama, including Colbert County. Colbert County is located in two physiographic provinces of the eastern United States. The western part of the county is in the East Gulf Coastal Plain section of the Coastal Plain physiographic province. The central and eastern parts of the county, which include the Project Site, are in the Highland Rim section (Cook et al. 2009).

The source of groundwater in the Tennessee River watershed is precipitation, which averages about 56 inches per year. The groundwater system is characterized by relatively shallow, fractured, Paleozoic clastic and carbonate aquifers with widespread karst development in the north-central part of the watershed and coarse-grained Cretaceous sediment cover in the western part of the watershed (Cook et al. 2009).

Groundwater recharge in much of the watershed is local. Recharge rates are controlled by a number of factors, including porosity and permeability, which, in Paleozoic aquifers within the Project Area, are enhanced by leached fossils, fractures, and solution development (Cook et al. 2009). Estimates of recharge can be useful in determining available groundwater, impacts of disturbances in recharge areas, and water budgets for water resource development and protection.

Groundwater availability is generally defined as the total amount of groundwater of adequate quality stored in the subsurface. Large quantities of groundwater in excess of 1 million gallons per day can be obtained from wells constructed in the Tuscumbia Limestone/Fort Payne Chert aquifer, if sufficient water-filled cavities are encountered (Cook et al. 2009).

Water quality in the vicinity of the Project Area is variable, but mostly suitable for all domestic uses. Sulfate and dissolved iron levels can be high, imparting a rotten-egg smell to the water and staining plumbing fixtures. Dissolved solids concentrations increase with depth in the aquifers, with concentrations as high as 1,000 milligrams per liter (Miller 1990).

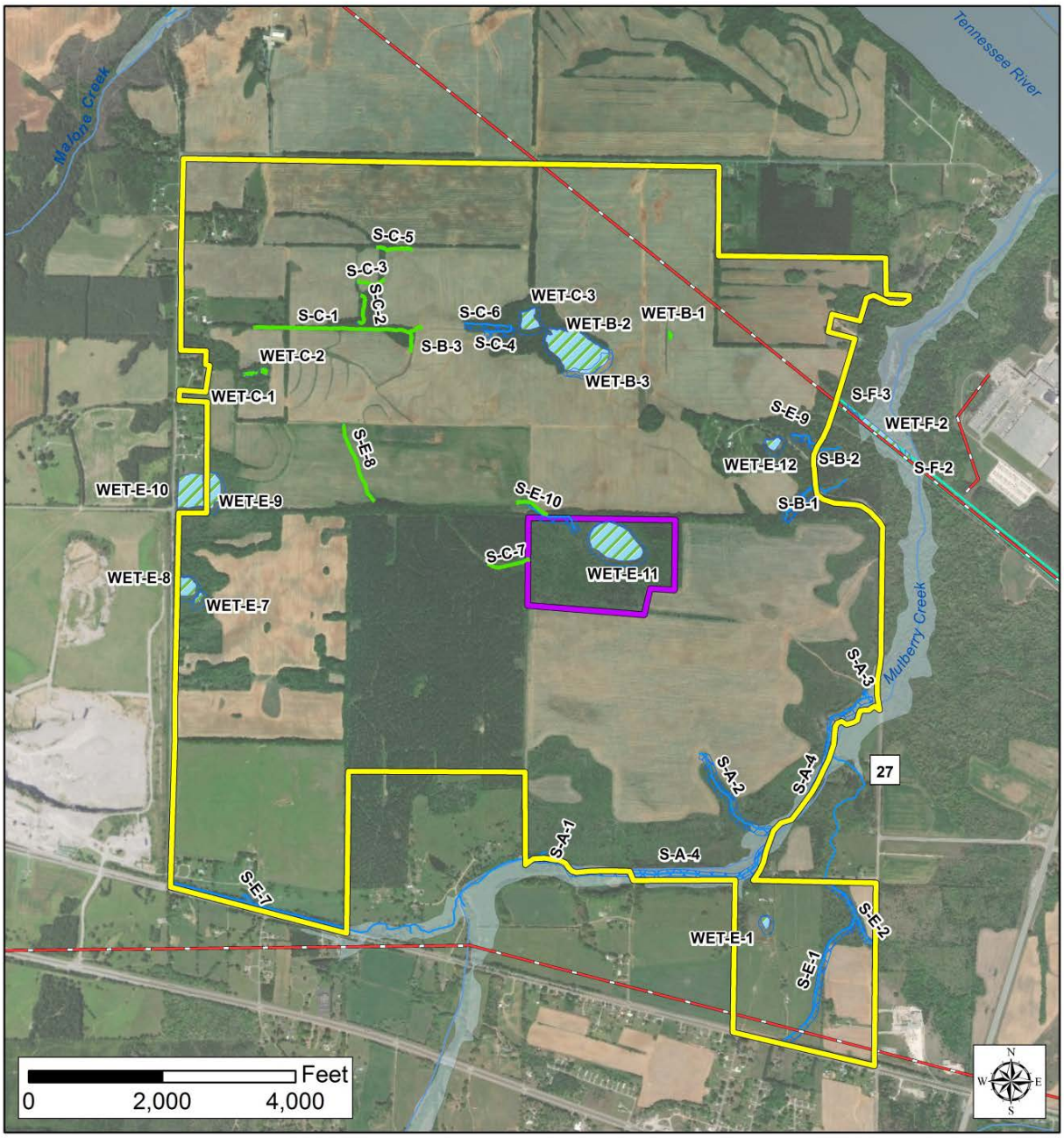
Total groundwater withdrawals for the region in 2005 were about 58 million gallons per day (mgd). Colbert County withdrew 3.54 mgd of groundwater in 2005 (Gill et al. 2013). Most of the groundwater withdrawals (36 percent) were used for public supply, followed by irrigation (27 percent), industrial (25 percent), residential (9 percent), and livestock (3 percent).

3.3.1.2 Surface Water

The proposed Project Area is located in the Tennessee River Watershed. The Tennessee River begins in Tennessee, crosses northern Alabama, and then runs north through Kentucky where it joins the Ohio River. The Tennessee River Basin occupies seven states throughout its length. The portion of the basin that runs through Alabama is called the Great Bend. In Alabama, the river basin drains 13 percent of the state, encompassing 51,000 square miles (Riversofalabama.org 2015).

On a smaller scale, the Project Site is located within the Pickwick Lake Watershed, which occupies parts of Alabama, Tennessee and Mississippi. There are six waterbodies in the watershed, including Pickwick Reservoir, which is a man-made reservoir on the Tennessee River. As of 2016, three of these waterbodies were considered impaired, mostly due to runoff from agricultural activities (EPA 2019a).

There are 13 wet weather conveyances, two ephemeral drainages, three intermittent steams, and one perennial stream (Mulberry Creek) that occur within the Project Site (Figure 3.3-1) (Cardno 2019). Table 3.3-1 lists the stream ID, various stream measurements, substrate, and a preliminary jurisdictional determination of each stream. Mulberry Creek, all of the intermittent streams, and two ephemeral streams may possess a hydrological connection to the Tennessee River, which is a traditional navigable water. Therefore, these features may likely be classified as jurisdictional under USACE guidance. Streams were also classified, and the TVA hydrologic determination field data sheets are included in Appendix G (See Natural Resources Report Appendix A). Mulberry Creek flows within the southeast portion of the Project Site after it crosses Old Lee Highway and then flows near the eastern boundary of the Site to its confluence with the Tennessee River. Mulberry Creek is not included on the Alabama Clean Water Act Section 303(d) list of impaired waters.



Legend

- Proposed Action Alternative Boundary
- Existing Transmission Line Requiring Upgrade
- 1% Annual Chance Flood Hazard Zone
- Wetlands
- 50-ft Wetland Buffer
- Conservation Easement
- 50-ft Stream Buffer
- Non-jurisdictional isolated wetlands and streams to be permanently impacted
- Streams
- Existing 161 kV Transmission Line

Source: ArcGIS Aerial Map, Wetland and Streams; Cardno

Figure 3.3-1. Drainages, Streams and Wetlands Within the Muscle Shoals Solar Project Site

Figure 3.3-1. Drainages, Streams and Wetlands Within the Muscle Shoals Solar Project Site

Table 3.3-1. Drainages and Streams Identified Within the Project Site

Stream ID	Flow Type	Stream Length (ft)	Water Depth	Width at Bankfull (ft)	Substrate	Jurisdictional
S-A-1*	WWC	191	0	2.5	Organic	No
S-A-2*	Ephemeral	2,182	0	4	Organic	Yes
S-A-3*	WWC	178	0	2	Organic	No
S-A-4 (Mulberry Creek)*	Perennial	4,365	6	17	Cobble/ Organic	Yes
S-B-1*[a]	WWC	532	0	2.5	Organic	No
S-B-3*	WWC	407	0	3	Organic	No
S-C-1	WWC	2,588	0	2.5	Organic	No
S-C-2	WWC	561	0	3.5	Organic	No
S-C-3	WWC	477	0	3.5	Organic/ag field	No
S-C-4	WWC	681	0	1.5	Organic/ag field	No
S-C-5	WWC	567	0	2.5	Organic	No
S-C-6	WWC	511	0	3.5	Organic	No
S-C-7	WWC	661	0	1.5	Organic	No
S-E-1*[a]	Intermittent	5,490	0.25	8.0	Organic	Yes
S-E-2	Ephemeral	534	0.5	2.0	Organic	Yes
S-E-6 (Mulberry Creek)	Perennial	6,253	1.0	14.0	Organic/Cobble	Yes
S-E-7	Intermittent	202	0	0.5	Organic	Yes
S-E-8	WWC	1,286	0	0.5	Organic	No
S-E-9	Intermittent	554	0.5	8.0	Organic/Cobble	Yes
S-E-10	WWC	1.088	0.25	0.5	Ag-Field	No
Total		**29,308**				
Total Non-Jurisdictional		**9,728**				
Total Jurisdictional		**19,580**				

* Indicates features from studies for which approved jurisdictional determination (AJD) applications have been submitted
[a] Stream segment is partially outside of Project Site
WWC = Wet Weather Conveyance

TVA Colbert FP-Cherokee-Burnsville 161-kV Transmission Line

The existing 161-kV transmission line running from the northeastern corner of the Project Site to the Colbert Fossil Plant Switchyard was also investigated (Cardno 2019). As shown in Figure 3.3-2, two ephemeral drainages and two perennial streams (Mulberry Creek and Cane Creek) were identified within the TVA ROW (Table 3.3-2).

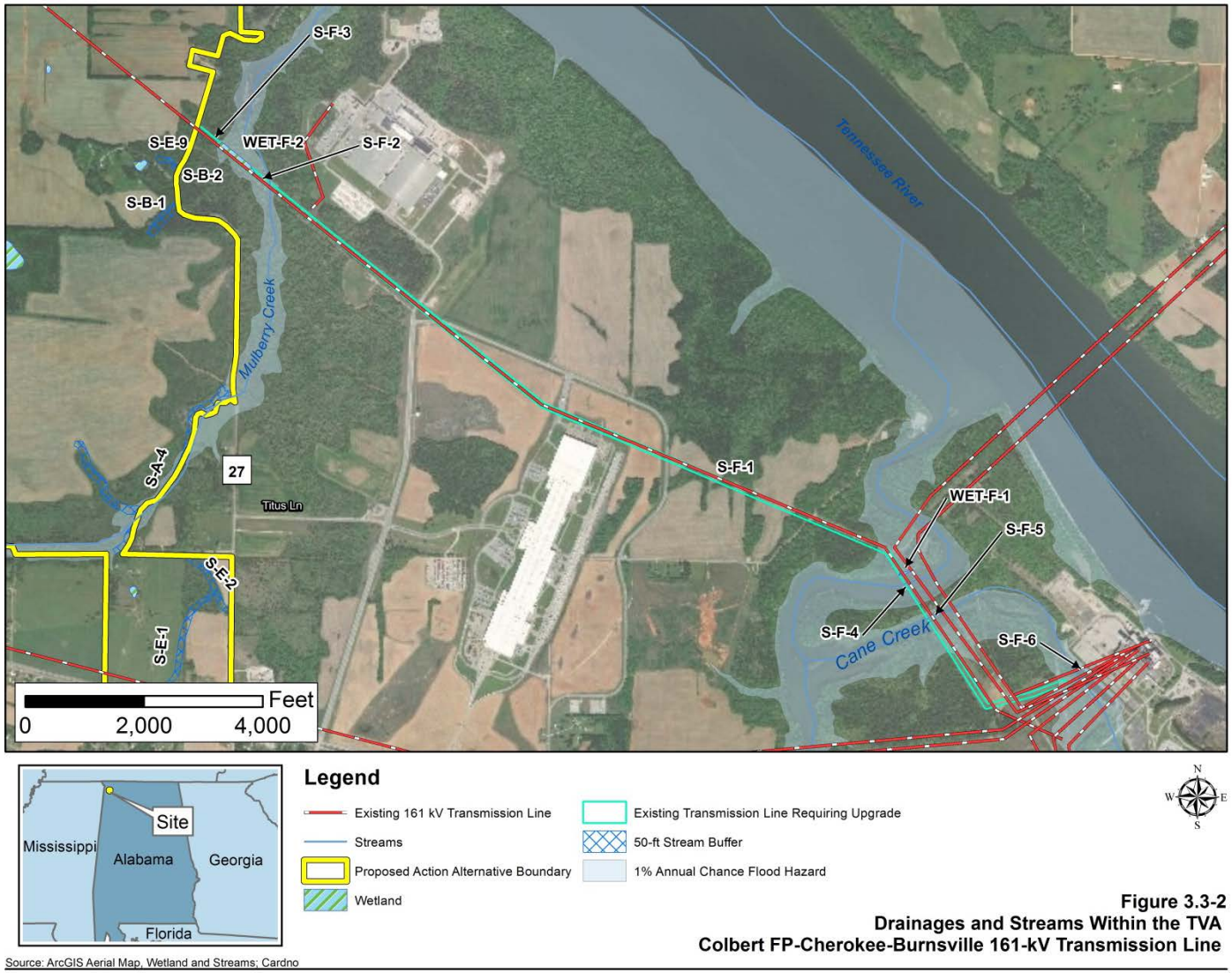


Figure 3.3-2. Drainages and Streams Within the TVA Colbert FP-Cherokee-Burnsville 161-kV Transmission Line

Table 3.3-2. Drainages and Streams Identified Within the TVA Colbert FP-Cherokee-Burnsville 161-kV Transmission Line

Stream ID	Flow Type	Length within ROW (ft)	Water Depth (inches)	Top of Bank at Bankfull (ft)	Substrate	Jurisdictional
S-F-1*	Ephemeral	141	0	4	Organic	Yes
S-F-2 (Mulberry Creek)*	Perennial	142	20	64	Cobble/Organic	Yes
S-F-3*	Ephemeral	377	0	5	Organic	Yes
S-F-4 (Cane Creek)*	Perennial	236	48	540	Cobble/Organic	Yes
S-F-5 (Cane Creek)*	Perennial	202	40	162	Cobble/Organic	Yes
S-F-6 (Cane Creek)*	Perennial	190	40	200	Cobble/Organic	Yes
Total		**1,288**				
Total Non-Jurisdictional		**0**				
Total Jurisdictional		**1,288**				

* Indicates features from studies for which AJD applications have been submitted

3.3.1.3 Floodplains

A floodplain is the relatively level land area along a stream or river that is subject to periodic flooding. The area subject to a one-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. It is necessary to evaluate development in the floodplain to ensure that the Project is consistent with Executive Order (EO) 11988, Floodplain Management.

The Federal Emergency Management Agency (FEMA) produces maps which show the likelihood of an area flooding. These maps are used to determine eligibility for the National Flood Insurance Program. The majority of the Project Site is located in Zone X, outside of the 100- and 500-year zones, having less than a 0.2 percent chance of flooding annually. Mulberry Creek is designated by FEMA as being located in Zone A. Areas within Zone A have a 1 percent chance of flooding annually and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown for these zones. Approximately 39.5 acres of the Project Site are located within the Mulberry Creek flood hazard zone (Figure 3.3-1). It is possible that minor, localized flooding could be associated with this portion of Mulberry Creek.

3.3.1.4 Wetlands

Wetlands are defined by the USACE (Environmental Laboratory 1987) and the EPA (Federal Register 1980) as those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. An area is a wetland if it meets the wetland hydrology, hydrophytic vegetation, and hydric soil criteria established in the USACE Manual.

Identification of waterbodies and delineations of wetlands was conducted during four site visits to different portions of the Project Area from June 2016 to November 2018. Wetland delineation surveys were completed in accordance with the USACE Wetland Delineation Manual (Environmental Laboratory 1987) and Eastern Mountains and Piedmont Regional Supplement to the USACE Delineation Manual (USACE 2012). In addition, TVA Rapid Assessment Method datasheets were completed for all wetlands; each wetland was classified based on function and value consistent with EO 11990 – Protection of Wetlands. The USACE wetland determination data forms and TVA Rapid Assessment Method datasheets are included in the Natural Resources Report (Cardno 2019; Appendix G).

Soils were delineated with the X-Rite Munsell M50215B Soil Book of Color, and exhibited a hue, lightness, and chroma ranging from 5 YR (3/3) to 10YR (5/3) throughout the Project Site. The wetland datasheets presented in the Natural Resources Report (Appendix G) provide soils color data for each soil pit. Wetland community identification was based on soils, hydrology, and an emphasis on dominant vegetation.

The entire Project Site was investigated for wetlands that exhibited the three USACE criteria (hydrophytic vegetation, wetland hydrology, and hydric soils). These on-site investigations identified fifteen wetlands (Table 3.3-3) totaling approximately 28 acres. The wetlands are shown on Figure 3.3-1.

Table 3.3-3. Wetlands Within the Project Area

Wetland ID	Type	Acreage	Jurisdictional	TVA RAM Category
WET-B-1*	PEM	0.22	No	1
WET-B-2*	PEM	8.48	No	2
WET-B-3*	PFO	1.06	No	2
WET-C-1	PEM	0.23	No	1
WET-C-2	PSS	0.28	No	1
WET-C-3	PFO	1.43	No	2
WET-E-1	PUB(x)	0.40	No	N/A
WET-E-2	PUB(x)	2.47	Yes	N/A
WET-E-3	PUB(x)	0.45	No	N/A
WET-E-4	PUB(x)	0.30	No	N/A
WET-E-7	PSS	0.27	No	2
WET-E-8	PFO	1.77	No	2
WET-E-10	PSS	2.24	No	2
WET-E-11	PUB(x)	7.36	No	N/A
WET-E-12	PUB(x)	0.63	No	N/A
Total		**27.59**		
Total Non-Jurisdictional		**25.12**		
Total Jurisdictional		**2.47**		

* Indicates features from studies for which AJD applications have been submitted
PEM – Palustrine Emergent Wetland
PFO – Palustrine Forested Wetland
PSS – Palustrine Scrub-Shrub Wetland
PUB(x) – Freshwater Pond
RAM – TVA Rapid Assessment Method

Three types of wetland vegetative communities were identified within the Project Site: Palustrine Emergent Wetland (PEM), Palustrine Scrub-Shrub (PSS) Wetland, and Palustrine Forested Wetland (PFO). A significant portion of the Site is active or recently active agricultural land currently producing corn, wheat, or soybean. Community identification was based on soils, hydrology, and an emphasis on dominant vegetation. The Natural Resources Report contains datasheets that include data point-specific vegetative community species data (Appendix G).

The majority of the Project Site is relatively well drained by overland flow, ephemeral agricultural drainages, and culverts; these lead to ponded areas or to larger water bodies including Mulberry Creek that has a nexus to the Tennessee River. Multiple depressions and/or ponded areas were identified by reviews of aerial imagery. These areas were inspected during the on-site investigations and the six on-site ponds were found to be holding water (Cardno 2019).

TVA Colbert FP-Cherokee-Burnsville 161-kV Transmission Line

The existing 161-kV transmission line running from the northeastern corner of the Project Site to the Colbert Fossil Plant Switchyard was also investigated for wetlands that exhibited the three

USACE criteria (hydrophytic vegetation, wetland hydrology, and hydric soils). As shown in Figure 3.3-2, two wetlands were identified within the TVA ROW, totaling 1.93 acres (Table 3.3-4).

Table 3.3-4. Wetlands Within the TVA Transmission Line ROW

Wetland ID	Type	Acreage	Jurisdictional	TVA RAM Category
WET-F-1	PEM	0.15	Yes	3
WET-F-2	PEM	1.78	Yes	3
Total		**1.93**		
Total Non-Jurisdictional		**0**		
Total Jurisdictional		**1.93**		

3.3.2 Environmental Consequences – Water Resources

This section describes the potential impacts to water resources should the Proposed Action or No Action Alternative be implemented.

3.3.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and upgrades to the existing transmission line would not be constructed; therefore, no Project related impacts to water resources would be expected to occur. Existing land use would remain a mix of farmland and undeveloped, privately-owned land, and water resources would remain as they are at the present time. Indirect impacts to water resources could result due to the continuing use of the Project Site as agricultural land. Increases in erosion and sediment runoff could occur if farming practices were not maintained to prevent erosion and runoff. Erosion and sedimentation on the Project Site could alter runoff patterns and impact downstream surface water quality. In addition, if chemical fertilizers and pesticides are continually used, impacts to groundwater may occur if the local aquifers are recharged from surface water runoff.

3.3.2.2 Proposed Action

Groundwater

No adverse impacts to groundwater would be anticipated as a result of the Proposed Action. Once installed, the total surface area of PV panels would cover approximately 1,911 acres. The elevated PV panels would cover almost the entire Site; however, the panels would have relatively little effect on groundwater infiltration and surface water runoff. Rainwater would run off the panels to the adjacent ground where ground infiltration would occur, or it would run off and be collected within the on-site stormwater detention basins. Hazardous materials that could potentially contaminate groundwater would not be used or stored at the Site. However, use of petroleum fuels, lubricants and hydraulic fluids during construction and by maintenance vehicles would result in the potential for small on-site spills. The use of BMPs to properly maintain

vehicles to avoid leaks and spills and procedures to immediately address any spills that did occur, would minimize the potential for adverse impacts to groundwater.

The Project will comply with the requirements of the Clean Water Act through preparation and implementation of a Construction Best Management Practices Plan (CBMPP) and filing of a NOI to comply with the Construction General NPDES Permit. The CBMPP would include procedures to be followed during construction to implement and maintain effective erosion and sediment controls. The plan would also address non-stormwater discharges and contact between stormwater and potentially polluting substances.

Indirect beneficial impacts to groundwater could occur if panel placement and/or the use of buffer zones leads to fewer pollutants and erosion products entering groundwater. Currently, most of the on-site land use is agricultural, which provides for the possibility of fertilizer and pesticide runoff entering groundwater. The construction and operation of the Proposed Action could eliminate the source of these potentially damaging impacts, resulting in a beneficial, though minor, indirect impact to groundwater.

Activities related to the electrical interconnection of the Muscle Shoals Solar Project Site with the TVA Colbert FP-Cherokee-Burnsville 161-kV transmission line, as well as planned upgrades to the existing line would have no adverse impacts on groundwater.

Surface Water

Construction and operation of the Muscle Shoals Solar Project could affect surface waters. During construction, runoff of sediment and pollutants could adversely impact surface water quality on the Project Site. The use of BMPs for controlling soil erosion and run off would minimize these potential impacts to surface water. Additionally, construction of on-site stormwater detention basins would allow sediments to settle out prior to release.

During the site layout development process (Figure 2-2), jurisdictional streams and wetlands were avoided. Buffers of 50 ft would be maintained along each side of jurisdictional wetlands and streams as a conservative avoidance measure. These areas would be avoided during construction to the greatest extent feasible, although minor work would be expected to occur within the buffer zones. Specifically, small crossings or culverts would be installed over small non-jurisdictional streams (if necessary) to access collection blocks once the final design is determined. Additionally, approximately 6,900 linear ft of the streams and stream segments determined by the USACE to be non-jurisdictional would be included in areas that would be permanently disturbed (Figure 3.3-1).

Water needs for the Project Site would be met using groundwater or water trucks; the Proposed Action would not require potable water or a water treatment system. The Project Site would not have permanent on-site sanitary facilities. During construction, portable chemical toilets would be used and groundwater or trucked-in water would be used for dust suppression. During operation, modules would be cleaned using trucked-in purified water, free of detergents and additives. Module cleaning would occur two or fewer times a year. During decommissioning,

portable chemical toilets would be used by workers, and either groundwater or trucked-in water would be used for dust suppression.

Vegetation on the Project Site would be actively maintained to control growth and prevent overshadowing or shading of the PV panels. In addition to mowing, trimming and possibly sheep grazing, pre-emergent and post-emergent herbicides may be selectively used and no herbicides would be used in the buffer areas or immediately adjacent to any waterbodies. Any herbicides used would be applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the EPA would be used. Herbicides would be applied per the EPA-approved label or by a certified, licensed applicator. A list of the herbicides currently used by TVA in ROW management is presented in Appendix E. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

As described above for groundwater, minor beneficial, indirect impacts to surface water could result from the change in land use and the reduction in the amount of fertilizer and pesticide runoff to surface water resources, the reduced likelihood of erosion and sedimentation, and the reduction of disturbance activities on the Project Site.

The construction of the transmission line connection from the Project Site to the Colbert FP-Cherokee-Burnsville line would occur simultaneously with the construction of the solar arrays. No streams would be directly impacted. An overhead electrical connector would be constructed across Mulberry Creek (Figure 2-2) to connect the solar arrays in the southeastern portion of the Project Site with the panels in the central portion of the Project Site. This connector would be an overhead transmission line that would span the width of the creek in order to minimize potential impacts. BMPs would be used throughout these processes to minimize any possible water quality impacts related to soil erosion. Planned upgrades/improvements to the existing TVA Colbert FP-Cherokee-Burnsville 161-kV transmission line (see Section 2.2.3) could potentially impact the two ephemeral streams within the transmission ROW and the line crossing Mulberry Creek and Cane Creek. Adherence to TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, Transmission Construction Guidelines Near Streams (Appendices A, B and C), and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities (TVA 2017) would ensure that the impacts of the upgrade/improvement activities on the existing transmission ROW are not significant.

Floodplains

As a federal agency, TVA adheres 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" (EO 11988, Floodplain Management). 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 (U.S. Water Resources Council, 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

The Proposed Action would involve constructing a solar PV facility within the Project Site (Figure 2-2), consisting of about 1,900 acres of solar panels on posts; six site entrances; four stormwater basins; access roads; laydown areas; a substation constructed by Muscle Shoals Solar; an overhead electrical connector to the panels located in the southeast portion of the Project Site; concrete pads for transformers and inverters; site grading, grubbing, and clearing; fencing and lighting; installation of groundwater wells; three new TVA transmission towers; and the Mulberry Creek Switching Station constructed by TVA.

As noted in Section 2.2.2, development of the solar facility would be restricted to areas outside the exclusion areas shown in Figure 2-3. The exclusion areas were established by Muscle Shoals Solar to protect floodplains and other sensitive resources. Of the facilities mentioned above, only the overhead electrical connector, portions of the fencing, and portions of the lighting would be located within the floodplain of Mulberry Creek. Consistent with EO 11988 and TVA's 1981 Class Review of Certain Repetitive Actions in the 100-year Floodplain, fencing and light poles would be considered repetitive actions in the 100-year floodplain that should result in minor impacts (TVA 1981). The electrical connecter would be considered a utility, which is also a repetitive action in the 100-year floodplain. To minimize adverse impacts, the fencing, lighting, and electrical connector would be designed and constructed to withstand flooding with minimum damage.

Demolition of existing structures on the Project Site could also occur. Demolition would be consistent with EO 11988, because the demolition debris would be disposed of outside of floodways.

Once the final site layout is complete, the four proposed drainage basins could be located in places other than the specific locations shown in Figure 2-2; however, as noted in Section 2.2.2, development of the solar facility would be restricted to areas outside the exclusion areas shown in Figure 2-3, which would avoid 100-year floodplains. Therefore, other locations for stormwater basins within the Project Site boundary would also be consistent with EO 11988.

The Proposed Action would also involve modifications to an existing TVA transmission line, potential construction of access roads to the existing TVA transmission line, construction of three transmission towers to tie to the Project Substation between Structures 24 and 25 of the Colbert FP-Cherokee-Burnsville transmission line, a permanent easement for access to the proposed Mulberry Creek Switching Station, as well as installation of telecommunications connections inside buildings at the proposed Mulberry Creek Switching Station and the existing Colbert Fossil Plant, Burnsville, South Jackson, and Tupelo substations. Telecommunications connections would involve installing equipment inside existing structures located outside the 100-year floodplain at the Colbert, Burnsville, South Jackson, and Tupelo substations, which would be consistent with EO 11988.

The three towers to connect to the Project Substation would be located between structures 24 and 25 on the existing transmission line (Figure 2-1) and the proposed Project Substation, outside 100-year floodplains, which would be consistent with EO 11988. As shown in Figure 3.3-3, five structures would be replaced to accommodate the Project.

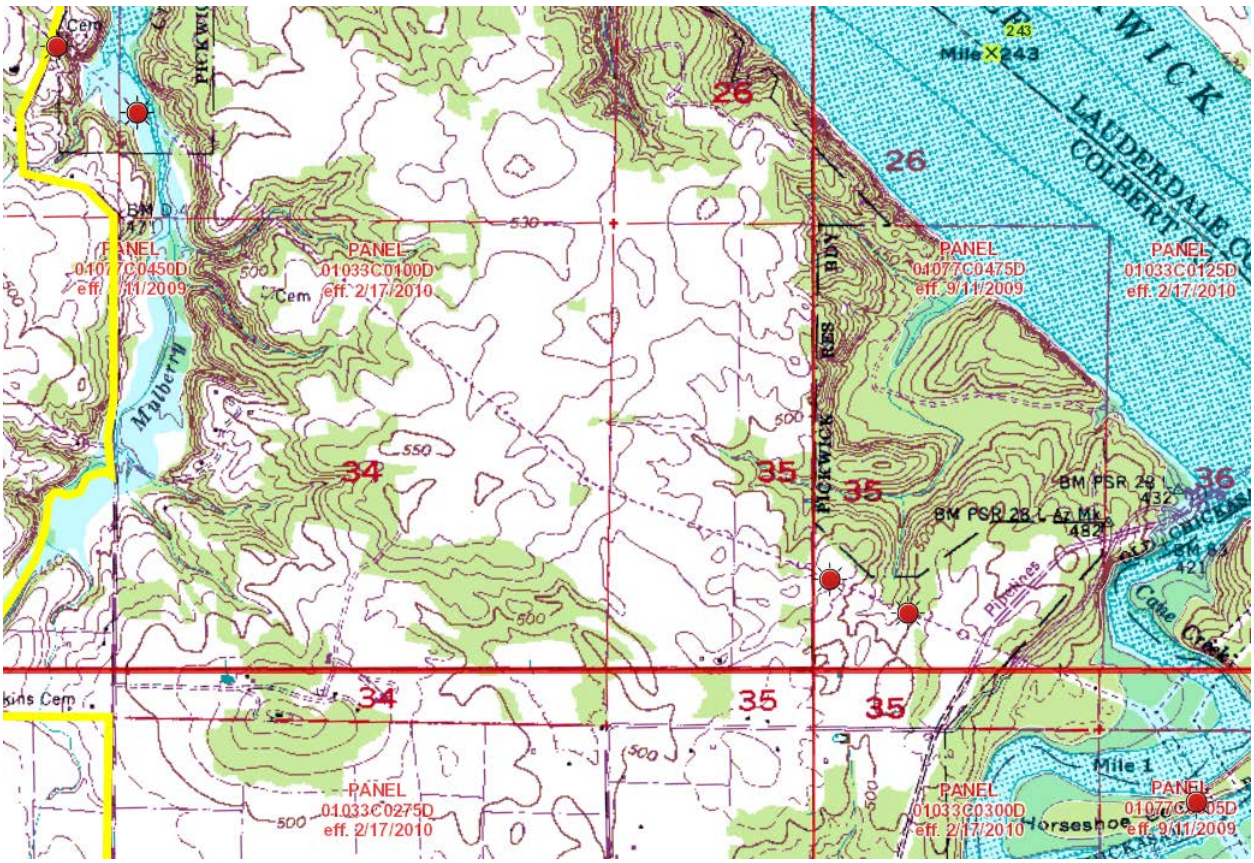


Figure 3.3-3. Transmission structures (in red) to be replaced on the existing TVA transmission line

Of the five structures to be replaced, only Structure 27 is located within the 100-year floodplain. Consistent with EO 11988 and TVA's 1981 Class Review of Certain Repetitive Actions in the 100-year Floodplain, replacement of a transmission structure would be considered to be a repetitive action in the 100-year floodplain that should result in minor impacts (TVA 1981). To minimize adverse impacts, standard BMPs would be used during replacement activities, and any road construction in the 100-year floodplain of Mulberry Creek, if needed, would not increase base flood levels by more than 1.0 foot.

Indirect impacts could include development to enhance, serve, or service the Project. Colbert County, Alabama, participates in the National Flood Insurance Program, and any development must be consistent with its flood damage prevention ordinance. Therefore, compliance with the requirements of the flood damage prevention ordinance would ensure that impacts on the floodplain, as well as to development constructed within the floodplain, would be minimal.

Based on the following mitigation measures, the Proposed Action would have no significant impact on floodplains and their natural and beneficial values:

- standard BMPs would be used during replacement activities;
- any road construction in the 100-year floodplain of Mulberry Creek would not increase base flood levels by more than 1.0 foot;
- demolition debris would be disposed of outside of floodways; and
- the fencing, lighting, and electrical connector would be designed and constructed to withstand flooding with minimum damage.

Wetlands

Under the Proposed Action, potential impacts to wetlands would be minimized as the Project Site layout was designed to specifically avoid jurisdictional aquatic features, permanent waterbodies, and other sensitive biological areas. Additionally, 50 ft buffers would be maintained along each side of jurisdictional wetlands. Throughout the Project, BMPs (e.g., silt fences, hand-clearing of vegetation, etc.) would be implemented in order to minimize any soil disturbance within 50 ft of on-site wetlands and jurisdictional streams. The floor and embankments of the on-site detention basin(s) would be allowed to naturally reestablish native vegetation after construction, or replanted as necessary, to provide natural stabilization, minimizing subsequent erosion.

Three isolated non-jurisdictional wetland areas within the Project Site totaling approximately 0.73 acres would be permanently disturbed and filled in order to accommodate additional solar arrays. The three wetlands identified as WET-B-1, WET-C-1, WET-C-2 in Table 3.3-3 are shown on Figure 3.3-1. No other impacts to wetlands would be anticipated as a result of construction and operation of the solar facility. Due to the Project siting requirements described in Section 2.3, TVA has determined that there is no practicable alternative to the permanent disturbance of approximately 0.73 acres of non-jurisdictional, low-quality, isolated wetlands. Measures described in the previous paragraph would help minimize wetland impacts. This, the action is consistent with the requirements of EO 11990, Protection of Wetlands.

Muscle Shoals Solar submitted a letter requesting a jurisdictional determination (JD) from the USACE Nashville District on January 31, 2019 (Appendix F). The USACE conducted a site visit on April 18-19, 2019. The response from the USACE regarding the Jurisdictional Determination will be included in the Final EA.

Planned upgrades/improvements to the existing TVA Colbert FP-Cherokee-Burnsville 161-kV transmission line (see Section 2.2.3) could potentially impact two wetlands within the transmission ROW and the line crossing Mulberry Creek and Cane Creek. The two wetlands identified as WET-F-1 and WET-F-2 in Table 3.3-4 are shown on Figure 3.3-1. Since this is an existing transmission line and ROW, the upgrade/improvement activities are not expected to

directly impact the wetlands. Adherence to TVA specifications and BMP's (TVA 2017) would ensure that the upgrade/improvement activities do not adversely affect these wetlands.

3.4 BIOLOGICAL RESOURCES

This section provides an overview of existing biological resources within the Muscle Shoals Solar Project Area, including the transmission line that would be upgraded in conjunction with the Project and the potential impacts to biological resources that would be associated with the Proposed Action and No Action Alternatives. The biological resources that have been analyzed below are vegetation; wildlife; and rare, threatened, and endangered species. Unless cited separately, information has been summarized from the Natural Resources Report for the Muscle Shoals Solar Project (Cardno 2019; Appendix G).

The Project Area is located within the Tennessee River watershed in the northwestern portion of Alabama in Colbert County near the city of Florence. The Project Area falls within the Eastern Highland Rim ecoregion and consists of a weakly dissected, nearly flat to gently rolling plateau. Natural vegetation for the region is transitional between the oak-hickory type to the west and the mixed mesophytic forests of the Appalachian ecoregions to the east. Much of the original bottomland hardwood forest has been inundated by impoundments. The flatter areas in the east and on both sides of the Tennessee River have deep, well-drained, reddish soils that are intensively farmed. Pickwick Lake, an impoundment of the Tennessee River, is located approximately 0.5 mile to the northeast of the Project Site. Additionally, three tributaries of the Tennessee River exist near the Project Area. Malone Creek is located approximately 0.3 mile to the northwest, and Mulberry Creek flows through the southern portion of the Project Site then northward adjacent to and outside of the eastern property boundary. Cane Creek is located approximately 1.8 miles to the east and is crossed at three points by the eastern end of the TVA transmission line ROW near the TVA Colbert Combustion Turbine Plant.

A 30-year conservation easement was established in 2001 for an approximately 66-acre area near the center of the Project Site (Figure 2-2). The easement area encompasses deciduous forest and wetlands around Williams Pond. The easement was established under the Wetlands Reserve Program in a legal agreement between the previous property owners and the Commodity Credit Corporation of the USDA. The purpose of the easement is to protect, restore, and enhance the wetlands, wetland functions, and associated wildlife habitat of this area through limitations on the activities that the landowners may perform in the easement area. The deed also includes an easement for a 30-ft-wide access corridor extending from Mulberry Lane to the easement area.

Desktop investigations were conducted prior to field delineations of the proposed Project Area. Wildlife, vegetation, and threatened and endangered (T&E) species were researched during the desktop investigations and verified through the field delineations (June 2016 to January 2019). Results of desktop investigations and field delineations are described in this section.

Biological resources are regulated by a number of federal laws. The laws relevant to biological resources in the vicinity of the Proposed Action include the following:

- NEPA (42 U.S.C. §§ 4321-4347)
- Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544)
- Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-712)
- Bald and Golden Eagle Protection Act.

3.4.1 Affected Environment – Biological Resources

The existing biological resources at the Muscle Shoals Solar Project Area include vegetation, wildlife, and rare, threatened, or endangered species.

3.4.1.1 Vegetation

Using the National Vegetation Classification System (Grossman et al. 1998), vegetation types observed during field surveys were classified as a combination of deciduous forest, evergreen forest, scrub/shrub, and herbaceous/agricultural vegetation. The plant communities observed in the Project Area (Figure 3.4-1) are common and well represented throughout the region.

The forests on the proposed Project Site consist of deciduous, evergreen, and mixed evergreen/deciduous forest. Deciduous forest, where deciduous trees account for more than 75 percent of total canopy cover, occupies about 14 percent of the Project Site. Red oak (*Quercus rubra*), pin oak (*Quercus palustris*), willow oak (*Quercus phellos*), sycamore (*Platanus occidentalis*), sweet gum (*Liquidambar styraciflua***)**, eastern cottonwood (*Populus deltoides*), and the invasive Chinese privet (*Ligustrum sinense*) are the dominant deciduous tree species on the Project Site. Trees found in forested wetlands on the Project Site include green ash (*Fraxinus pennsylvanica*), sweet gum, and black willow (*Salix nigra*).

Evergreen forest, which covers approximately 10 percent of the Project Site, has low species diversity and is dominated by loblolly pine (*Pinus taeda*) in the overstory. Most of these pines were planted in a 234-acre stand near the middle of the Project Site. The canopy trees in this pine plantation are approximately the same size and age (approximately 20 years old) and were planted to be harvested to produce wood products. This pine forest bears little resemblance to native plant communities found in the region. Eastern red cedar (*Juniperus virginiana*) is the other common species of evergreen tree in the Project area.

Shrub/scrub communities exist mainly as thickets of Chinese privet or young pine plantations and cover approximately 6 percent of the Project Site. This community occurs in the east-southeast portion of the Project Site between the riparian forest along Mulberry Creek and the cropland in the central portion of the Project Site.

Areas of herbaceous vegetation cover approximately 2 percent of the Project Site and are characterized by a greater than 75 percent component of forbs and grasses and a less than 25 percent component of other types of vegetation. Agricultural cropland accounts for approximately 67 percent of the Project Site and is mainly planted in wheat, soybeans, cotton,

or corn. Areas of wetlands cover approximately 1 percent of the Project Site, including a 50-ft buffer (see Section 3.3.1.4 for discussion of the wetland areas).

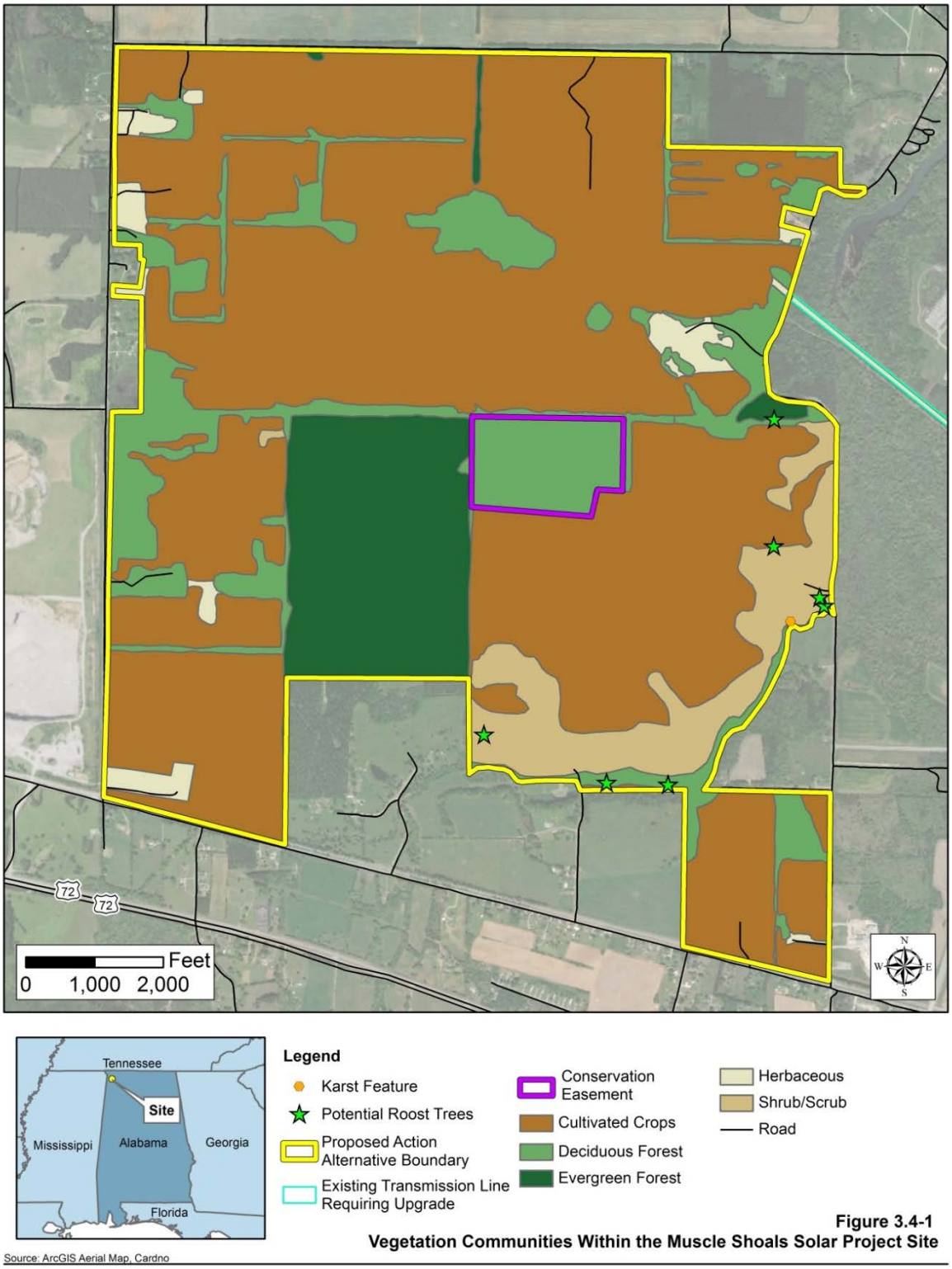


Figure 3.4-1. Vegetation Communities Within the Muscle Shoals Solar Project Site

The existing Colbert Fossil Plant-Cherokee-Burns 161-kV transmission line that would be upgraded in conjunction with the Proposed Action is within a 100-ft-wide ROW that extends approximately 3.8 miles southeast from the proposed location of the Muscle Shoals Solar Project substation to the substation at the TVA Colbert Combustion Turbine Plant. The predominant vegetation communities within this ROW are herbaceous (approximately 19 acres) and cultivated crops (approximately 10 acres), with less than an acre each of deciduous forest and shrub/scrub (Figure 3.4-2). In areas that are not used for agriculture, TVA actively maintains a herbaceous community in the ROW by controlling woody vegetation and limiting vegetation height.

3.4.1.2 Wildlife

Wildlife species likely to occur in the forest, field, and transitional ecotone habitats of the Project Site, as well as the ROW to the east, are those typically found in similar habitats of northern Alabama. Mammals likely to occur include the white-tailed deer (*Odocoileus virginianus*), woodchuck (*Marmota monax*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), raccoon (*Procyon lotor)*, gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), woodland vole (*Microtus pinetorum*), short-tailed shrew (*Blarina brevicauda*), and cotton mouse (*Peromyscus gossypinus*).

Birds likely to occur in the habitats of the Project Area include songbirds, birds of prey, game birds, and wading birds. Songbirds that commonly occur in these habitat types include the American crow (*Corvus brachyrhynchos*), northern cardinal (*Cardinalis cardinalis*), tufted titmouse (*Baeolophus bicolor*), brown thrasher (*Toxostoma rufum*), northern mockingbird (*Mimus polyglottos*), American robin (*Turdus migratorius*), chipping sparrow (*Spizella passerina*), and Carolina wren (*Thryothorus ludovicianus*). Birds of prey expected in these habitats include the red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), and turkey vulture (*Cathartes aura*). Game birds likely to occur include the wild turkey (*Meleagris gallopavo*), bobwhite (*Colinus virginianus*), and mourning dove (*Zenaida macroura)*. Wading birds likely to utilize riparian, pond, and wetland habitats of the Project Area include the green heron (*Butorides virescens*) and great blue heron (*Ardea herodias*).

Reptiles and amphibians likely to occur in the Project Area include the box turtle (*Terrapene carolina*), eastern garter snake (*Thamnophis sirtalis*), timber rattlesnake (*Croatus horridus*), black racer (*Coluber constrictor*), fence lizard (*Sceloporus undulatus*), upland chorus frog (*Pseudacris triseriata feriarum*), and American toad (*Bufo americanus*).

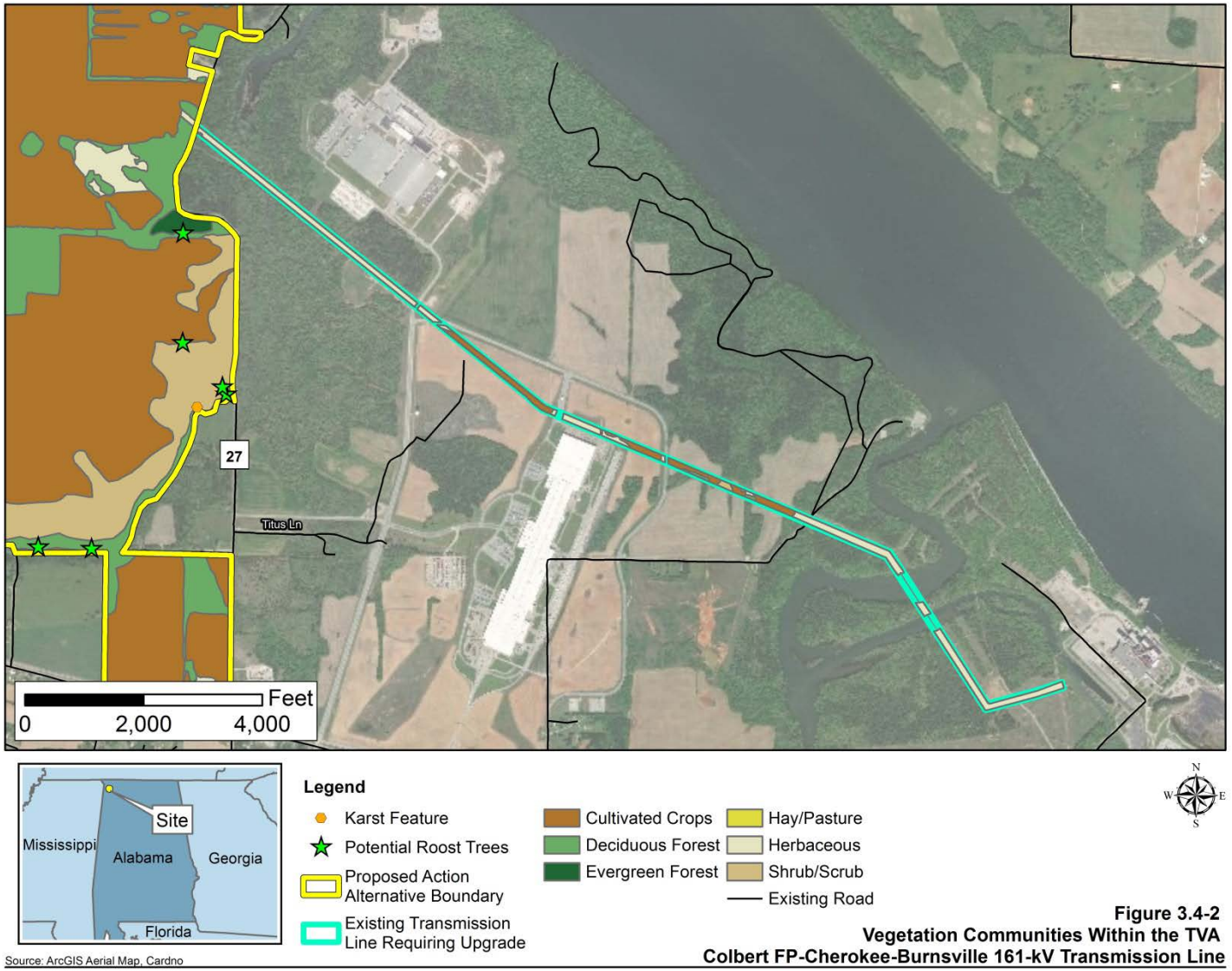


Figure 3.4-2. Vegetation Communities Within the TVA Colbert FP-Cherokee-Burnsville 161-kV Transmission Line

Many of these species are most likely to be found in relatively undisturbed areas of upland and riparian forest on the Project Site. However, the majority of the Project Site is actively farmed, so overall species diversity is expected to be relatively low, and most species present are widespread in their occurrence, adapted to open field habitats, and relatively common in the region. During the winter, the agricultural fields are likely to be used by waterfowl and other birds feeding on crop residues. The ponds in the Project area also may be used by waterfowl in the winter, as well as reptiles and amphibians year-round.

The TVA Natural Heritage Database identified eight caves within 3 miles of the Project area, the closest of which is approximately 371 ft from the existing ROW. A vertical crack in a rocky outcrop karst feature was observed on the Project Site near Mulberry Creek (Figure 3.4-1). This feature is not large enough for human entry and is unlikely to provide hibernacula for bats based on its shape, size, and structure. Summer use of this feature by a small number of day roosting bats is a possibility, though no guano or staining was observed around this feature. Figure 3.2-1 shows the locations of sinkholes (enclosed depressions with no surface drainage outlet) mapped by the USGS in the Project Area and vicinity. During cultural resources surveys of the Project Area, no subsurface openings were observed in the areas identified as sinkholes. Thus, the sinkholes in the Project Area do not appear to provide potential roosting habitats for bats.

Migratory Birds

Protected migratory birds include those identified above and essentially all other native birds that inhabit the vicinity of the Project Area (with the exception of the bobwhite, ruffed grouse, and wild turkey). The USFWS Information for Planning and Consultation (IPaC) Trust Resources Report for the Project Area (USFWS 2019a) contains a list of migratory birds of conservation concern (BCC) that potentially could occur in the area during breeding season, wintering season, or year-round. The list includes three BCC species that could occur in the area during the breeding season: the eastern whip-poor-will (*Antrostomus vociferous*), Kentucky warbler (*Oporornis formosus*), and prairie warbler (*Dendroica discolor*). The report also notes that the bald eagle is not a BCC in this area, but it is vulnerable and protected under the Bald and Golden Eagle Protection Act.

The Project Site generally does not provide suitable habitat for migratory bird species. The majority of the Project Site is currently intensively cultivated for agriculture, and these agricultural areas do not provide quality nesting habitat for these BCC species, the bald eagle, or most other birds. No records of colonial wading bird colonies or osprey nests are known within 3 miles of the Project Area (TVA 2019).

3.4.1.3 Threatened and Endangered (T&E) and Other Rare Species

Species with a federal or state listing status and other rare species with recorded occurrences in the vicinity of the Project Area were identified based on desktop research. The USFWS IPaC database (see USFWS 2019a in Appendix H of Cardno 2019 [Appendix G to this EA]) was used to identify species with federal listing status and the potential to occur in the vicinity of the Project Area. The TVA Natural Heritage Database was queried for federally listed species within Colbert County, Alabama and federal or state-listed species or other rare species with recorded

occurrences within a specified distance from the Project area. These buffer distances differed among groups of organisms as follows: aquatic species – 10 miles; terrestrial animals – 3 miles; and plants – 5 miles. Additionally, the Alabama Natural Heritage Program (ANHP) was consulted to determine if occurrences or habitats of any federally or state-listed bat or other T&E species have been documented on or in the vicinity of the Project Area (Cardno 2019; Appendix G).

USFWS must be consulted during the planning stages of a project with a federal nexus and the potential to affect T&E species. Depending on the nature of potential impacts to listed species, consultation may be informal or formal. Formal consultation is required if the Proposed Action has the potential to adversely affect listed species or their critical habitat. Based on the USFWS IPaC and TVA Natural Heritage databases, four mammal species, two bird species, one amphibian species, five fish species, 55 freshwater mussel species, 10 freshwater snail species, one insect species, and seven plant species have a rare status or rank and the potential to occur within the vicinity of, or be affected by, the Project. Table 3.4-1 lists these species along with their federal status, state status, and/or state rank. Consultation with the Alabama National Heritage Program (ANHP) determined that no instances of any federally or state-listed T&E species have been documented within 1 mile of the Project Area. The IPaC report identified no critical habitats within the Project Area or potentially affected by the Project.

Table 3.4-1. Species with Federal or State Status and Recorded Occurrences in the Vicinity of the Project Area

Scientific Name	Common Name	Federal Status	State Status	State Rank
Mammals				
Myotis grisescens	Gray bat[1,3,4]	LE	SP	S2
Myotis sodalis	Indiana bat[3]	LE	SP	S2
Myotis septentrionalis	Northern long-eared bat[3]	LT	SP	S2
Perimyotis subflavus	Tricolored bat[1]	–	–	S3
Birds				
Haliaeetus leucocephalus	Bald eagle[2]	–	SP	S4
Picoides borealis	Red-cockaded woodpecker[2]	LE	SP	S2
Amphibians				
Cryptobranchus alleganiensis	Hellbender[2,4]	–	SP	S2
Gyrinophilus palleucus palleucus	Pale salamander/Tennessee cave salamander[1,4]	–	SP	S2
Fishes				
Erimonax monachus	Spotfin chub[1,4]	LT	SP	SX
Etheostoma zonistium	Bandfin darter[1,4]	–	–	S2
Percina tanasi	Snail darter[1]	LT	SP	S1
Speoplatyrhinus poulsoni	Alabama cavefish[1,3]	LE	SP	S1
Typhlichthys subterraneus	Southern cavefish[1,4]	–	SP	S3
Freshwater Mussels				
Actinonaias ligamenta	Mucket[1]	–	PSM	S2

Table 3.4-1. Species with Federal or State Status and Recorded Occurrences in the Vicinity of the Project Area

Scientific Name	Common Name	Federal Status	State Status	State Rank
Alasmidonta marginata	Elktoe[1]	–	PSM	S1
Alasmidonta viridis	Slippershell[1]	–	SP	S1
Arcidens confragosus	Rock pocketbook[1]	–	PSM	S3
Cumberlandia monodonta	Spectaclecase[1,3]	LE	SP	S1
Cyclonaias tuberculata	Purple wartyback[1]	–	PSM	S5
Cyprogenia stegaria	Fanshell[1,2,3]	LE	SP	S1
Dromus dromas	Dromedary pearlymussel[1,2,3]	NEP/LE	SP	S1
Epioblasma brevidens	Cumberlandian combshell[1,2]	LE	SP	S1
Epioblasma obliquata obliquata	Purple catspaw[1]	–	SP	SX
Epioblasma personata	Round combshell[1]	–	PSM	SX
Ellipsaria lineolata	Butterfly[1]	–	PSM	S4
Elliptio dilatata	Spike[1]	–	PSM	S1
Epioblasma arcaeformis	Sugarspoon[1]	–	PSM	SX
Epioblasma biemarginata	Angled riffleshell[1]	–	PSM	SX
Epioblasma brevidens	Cumberlandian combshell[1]	NEP/LE	SP	S1
Epioblasma capsaeformis	Oyster mussel[1,2]	NEP/LE	SP	SX
Epioblasma florentina	Yellow blossom pearlymussel[1,2]	NEP/LE	SP	SX
Epioblasma haysiana	Acornshell[1]	–	PSM	SX
Epioblasma propinqua	Tennessee riffleshell[1]	–	PSM	SX
Epioblasma stewardsonii	Cumberland leafshell[1]	–	PSM	SX
Epioblasma torulosa torulosa	Tuberculed blossom pearlymussel[1,2]	NEP/LE	SP	SX
Epioblasma triquetra	Snuffbox[3]	LE	PSM	S1
Fusconaia cor	Shiny pigtoe[1,2]	NEP/LE	SP	S1
Lampsilis abrupta	Pink mucket[1,2,3]	LE	SP	S1
Lampsilis ovata	Pocketbook[1]	–	PSM	S2
Lampsilis virescens	Alabama lampmussel[1]	NEP/LE	SP	S1
Lasmigona complanata	White heelsplitter[1]	–	PSM	S2
Lemiox rimosus	Birdwing pearlymussel[1,2]	NEP/LE	SP	S1
Ligumia recta	Black sandshell[1]	–	PSM	S2
Obovaria olivaria	Hickorynut[1]	–	PSM	SX
Obovaria retusa	Ring pink[1,2,3]	LE	SP	SH
Obovaria subrotunda	Round hickorynut[1]	–	PSM	S2
Plethobasus cicatricosus	White wartyback[1,2,3]	LE	SP	S1
Plethobasus cooperianus	Orange-foot pimpleback[1,3]	LE	SP	SH
Plethobasus cyphyus	Sheepnose[1,2,3]	LE	SP	S1
Pleurobema clava	Clubshell[1,2]	NEP/LE	SP	SX
Pleurobema cordatum	Ohio pigtoe[1]	–	PSM	S2
Pleurobema oviforme	Tennessee clubshell[1]	–	PSM	S1
Pleurobema plenum	Rough pigtoe[1,2,3]	LE	SP	S!
Pleurobema rubrum	Pyramid pigtoe[1,2]	–	SP	S1

Table 3.4-1. Species with Federal or State Status and Recorded Occurrences in the Vicinity of the Project Area

Scientific Name	Common Name	Federal Status	State Status	State Rank
Pleuronaia dolabelloides	Slabside pearlymussel[1,2]	PE	SP	S1
Potamilus alatus	Pink heelsplitter[1]	–	–	S2
Potamilus ohiensis	Pink papershell[1]	–	PSM	S3
Ptychobranchus fasciolaris	Kidneyshell[1]	–	PSM	S2
Ptychobranchus subtentum	Fluted kidneyshell[1]	LE	SP	SX
Quadrula cylindrica cylindrica	Smooth rabbitsfoot[1,2]	PT	SP	S1
Quadrula intermedia	Cumberland monkeyface[1,2]	NEP/LE	SP	SX
Strophitus undulatus	Squawfoot[1]	–	PSM	S1
Toxolasma cylindrellus	Pale lilliput[1,2]	LE	SP	S1
Toxolasma lividus	Purple lilliput[1]	–	PSM	S2
Truncilla truncata	Deertoe[1]	–	PSM	S1
Villosa taeniata	Painted creekshell[1]	–	PSM	S2
Villosa vanuxemensis	Mountain creekshell[1]	–	PSM	S3
Freshwater Snails				
Athearnia anthonyi	Anthony's river snail[1,2]	NEP/LE	SP	S1
Elimia interveniens	Slowwater elimia[1,4]	–	–	S2
Elimia nassula	Round-rib elimia[1,4]	–	–	S1
Lithasia geniculata	Ornate rocksnail[1,4]	–	–	S1
Lithasia lima	Warty rocksnail[1,4]	–	–	S1
Lithasia salebrosa	Muddy rocksnail[1,4]	–	–	S1
Lithasia verrucosa	Varicose rocksnail[1,4]	–	–	S3
Pleurocera alveare	Rugged hornsnail[1,4]	–	–	S1
Pleurocera brumbyi	Spiral hornsnail[1]	–	–	S2S3
Somatogyrus strengi	Rolling pebblesnail[1]	–	–	S1
Insects				
Batrisodes specus	A beetle[1,4]	–	–	S2
Plants				
Crataegus triflora	Three-flowered hawthorn[1,4]	–	NS	S2
Dicentra cucullaria	Dutchman's breeches[1,4]	–	NS	S2
Enemion biternatum	False rue-anemone[1,4]	–	NS	S2
Frasera caroliniensis	American columbo[1,4]	–	NS	S2
Leavenworthia alabamica	Alabama glade-cress[1]	–	NS	S2
Lesquerella lyrata	Lyre-leaf bladderpod[1,4]	LT	NS	S1
Dalea foliosa	Leafy prairie-clover[1]	LE	NS	S1

Table 3.4-1. Species with Federal or State Status and Recorded Occurrences in the Vicinity of the Project Area

Scientific Name	Common Name	Federal Status	State Status	State Rank

Federal Status Abbreviations:
LE – Listed Endangered
LT – Listed Threatened
PE – Proposed Endangered
PT – Proposed Threatened
NEP – Nonessential Experimental Population (reintroduced to nearby reach of Tennessee River; LE elsewhere)
– – No federal status

State Status Abbreviations:
SP – State Protected
PSM – Partial Status - Mussels
NS – No state status for plants in Alabama

State Rank Abbreviations (Alabama Natural Heritage Program):S1 – Critically imperiled in Alabama because of extreme rarity or other factors making it vulnerable to extirpation from Alabama.
S2 – Imperiled in Alabama because of rarity or other factors making it vulnerable to extirpation from Alabama.
S3 – Rare or uncommon in Alabama
SH – Historical (possibly extirpated) in Alabama
SX – Presumed extirpated from Alabama

Footnotes – Sources where identified:
[1] TVA 2019 (buffer query: 10 mi aquatic, 3 mi terrestrial, 5 mi plants)
[2] TVA 2019 (county query [terrestrial] or hydrologic unit code query [aquatic])
[3] USFWS 2019a
[4] Alabama Natural Heritage Program 2019

Mammals

The federally listed mammal species identified as having the potential to occur in the vicinity of the Project area are the gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis),* and northern long-eared bat (*Myotis septentrionalis*). There are no designated critical habitats for these bats in the Project vicinity (USFWS 2019a). Field surveys of the Project area were performed to search for and document the locations of potential bat habitats. The surveys for bat habitat were conducted as prescribed in the *Range-wide Indiana Bat Summer Survey Guidelines* (USFWS 2018), which are also applicable to the northern long-eared bat. A team of scientists traversed the area at a casual pace looking for suitable habitat. Upon identifying potential habitat, the team logged the location using a global positioning system (GPS), marked potential habitat trees with red flagging tape, photographed the location, and completed a Phase 1 Habitat Assessment form. The Phase 1 Habitat Assessment forms for potential bat habitat areas are included in Appendix E of the Natural Resources Report (Cardno 2019; Appendix G of this EA). Approximately 200+ acres of potential foraging habitat and seven potential summer roosting trees exist along the Mulberry Creek riparian corridor.

The TVA Natural Heritage Database identified eight caves within 3 miles of the Project area, the closest of which is approximately 371 ft from the existing ROW. The other caves are more than 1 mile from the Project Area (TVA 2019a). A vertical crack in a rocky outcrop karst feature was observed on the Project Site near Mulberry Creek (Figure 3.4-1). This feature is not large enough for human entry and is unlikely to provide hibernacula for federally-listed bats based on

its shape, size, and structure. Summer use of this feature by a small number of day roosting, state-listed bats is a possibility, though no records of state-listed bats are known within 3 miles of this feature. No guano or staining was observed around this feature.(Cardno 2019; Appendix G of this EA). Figure 3.2-1 shows the locations of sinkholes mapped by the USGS in the Project area and vicinity. During cultural resources surveys of the Project area, no subsurface openings were observed in the areas identified as sinkholes. Thus, the sinkholes in the Project area do not appear to provide potential roosting habitats for bats.

Gray bat

The endangered gray bat roosts almost exclusively in caves throughout the year, using caves with different characteristics in winter and summer. It hibernates in caves in large numbers in winter months and migrates to warmer caves to form summer maternity or bachelor colonies. Gray bat foraging habitat is closely associated with rivers, lakes, and other large bodies of water over which it forages for mostly aquatic insects (NatureServe Explorer 2019a, USFWS 2009). Because the Project Site includes predominantly agricultural land and caves are not known to be present, it is very unlikely that the gray bat would roost on the Project Site. As mentioned above, the vertical karst feature identified near Mulberry Creek is unlikely to provide suitable habitat for federally-listed bats. One cave has been documented within 400 ft of the existing ROW. This cave is heavily disturbed by human visitors and has no documented use by federally-listed bats. However, suitable gray bat foraging habitat may potentially exist in the forest and shrub/scrub along Mulberry Creek. The Tennessee River is located within a half mile of the Project Site and also provides foraging habitat for the gray bat. The ROW to the east also provides forest edge habitat that may be used by the gray bat for foraging. The forests within the Project Area have not been surveyed specifically for the presence/absence of gray bats. The nearest recorded occurrence of the gray bat is approximately 4 miles from the Project Area (TVA 2019a).

Indiana bat

The endangered Indiana bat hibernates in caves and mines in winter and migrates to summer habitats in wooded areas. The large winter colonies disperse in spring, and reproductive females form smaller maternity colonies in wooded areas. Males and non-reproductive females roost in trees but typically do not roost in colonies (USFWS 2018). The Indiana bat typically forages in semi-open forested habitats and forest edges as well as riparian areas along river and lake shorelines (USFWS 2018, NatureServe Explorer 2019b). Suitable summer roosting habitat requires dead, dying, or living trees of sufficient size with sufficient exfoliating bark. Multiple roost sites are generally used. Primary summer roosts are typically behind the bark of large, dead trees, particularly those that are in gaps in the forest canopy or along forest edges so that they receive sufficient sun exposure (USFWS 2018).

Seven potential roosting trees (trees with loose bark or hollows) were identified in the deciduous forest and shrub/scrub along Mulberry Creek (Figure 3.4-1). The vertical karst feature identified near Mulberry Creek is unlikely to provide suitable habitat for federally-listed bats (see Appendix I, Figure 1 of Cardno 2019 [Appendix G of this EA]). One cave has been documented within 400

ft of the existing ROW. This cave is heavily disturbed by human visitors and has no documented use by federally-listed bats.

In addition to the potentially suitable summer roosting tree identified above, the riparian buffer of forest and shrub/scrub adjacent to Mulberry Creek may provide high quality foraging habitat for the Indiana bat. It consists of multiple tree species of varying age classes, a diverse understory, adjacent agricultural fields, and access to a constant water source. Additionally, lower-quality foraging habitat is present in the isolated forest tracts located in other parts of the Project Site. These tracts range in size from 37 acres to less than 1 acre and include large trees, scrub/shrub, and herbaceous vegetation layers. Several of these tracts contain isolated wetlands or seasonal streams. The ROW to the east also provides forest edge habitat that may be used by the Indiana bat for foraging.

Managed monoculture pine plantations, such as the stand of loblolly pines in the middle of the Project Site, provide poor-quality habitat for the Indiana bat, and this stand does not contain dead snags or old pine trees with loose bark suitable for roosting by bats (see Appendix I of Cardno 2019 [Appendix G of this EA]). There are no extant records of the Indiana bat in Colbert or Lauderdale counties (TVA 2019a).

Northern long-eared bat

The northern long-eared bat was officially listed as threatened in 2015, and the Project Area is within the range of this species, which includes 39 states across much of the eastern and north-central US. Its listing was based on the impacts from white-nose syndrome on a large proportion of the population, particularly in the northeastern US. The northern long-eared bat spends the winter hibernating in caves. In summer, it roosts singly or in colonies in live or dead trees beneath bark, in cavities, or in crevices. It also has been found, though rarely, roosting in barns, sheds, or other structures. The northern long-eared bat forages for flying insects by flying through the understory of forested hillsides and ridges (USFWS 2019b).

The proposed Project Site is predominantly agricultural land, and there are no large tracts of forest on hillsides or ridges on the Project Site that would provide ideal foraging habitats. However, the riparian buffer of forest and shrub/scrub adjacent to Mulberry Creek provides suitable foraging habitat for the northern long-eared bat. Additional lower-quality foraging habitats are present in the isolated forest tracts located in other parts of the Project Site, several of which contain isolated wetlands or seasonal streams. The karst feature documented on the eastern Project boundary near Mulberry Creek, as discussed above, is unlikely to provide suitable habitat for federally-listed bats. One cave has been documented within 400 ft of the existing ROW. This cave is heavily disturbed by human visitors and has no documented use by federally-listed bats. The only potential roosting habitat identified consists of approximately seven potential roost trees scattered within the riparian forest and shrub/scrub areas along Mulberry Creek (Figure 3.4-1). The nearest recorded occurrence of the northern long-eared bat is over 8 miles from the Project Area (TVA 2019a).

Tricolored Bat

The tricolored bat does not have a federal or state listing status, but it has a Natural Heritage state ranking of S3 (rare or uncommon in Alabama). This small bat (formerly known as the eastern pipistrelle) was one of the most common bat species throughout the forests of eastern North America. However, its populations are in decline due to white-nose syndrome. The tricolored bat uses a variety of forested habitats, preferring to forage in open woods, early successional stands, edge habitats near agricultural areas, areas adjacent to water bodies, and over water. Little is known about its daytime summer or maternity roosts, but they have been found in older forest in high tree cavities or crevices, sometimes in clusters of foliage. The tricolored bat hibernates in relatively warmer portions of caves or mines, usually roosting singly rather than in a group. It may make migrations of over a hundred miles between summer roosts and winter hibernacula (Bat Conservation International 2019, KDFWR 2014).

The Project Site is predominantly agricultural land, but it does include potentially suitable foraging habitat for the tricolored bat, including forest tracts and edges, isolated wetlands, and the riparian habitat along Mulberry Creek. Potential roosting habitat on the Project Site may be present in limited areas of mature hardwood forest. The karst feature documented on the eastern Project boundary near Mulberry Creek, as discussed above, is unlikely to provide suitable habitat for bats. Suitable hibernacula for the tricolored bat are not known to exist in the Project area. One cave has been documented within 400 ft of the existing ROW, but this cave is heavily disturbed by human visitors and has no documented use by bats.

Birds

The bald eagle forages mainly for fish in large lakes such as Pickwick Reservoir, and it typically nests in large trees in the vicinity of such water bodies. Suitable nesting, foraging, and wintering habitat for the bald eagle are present along the reservoir in areas where there are middle-age and mature woodlands. However, suitable foraging habitat and trees for roosting and nesting are not present in the predominantly agricultural Project area, and the bald eagle is not likely to occur in this area. No bald eagle nests were observed during field reviews. The closest documented bald eagle nest is more than 1 mile away. The red-cockaded woodpecker requires open pine forests with large, old trees. Nest cavities are excavated in mature pines typically over 80 years old. The pine forest in the Project area is a plantation of relatively young trees (approximately 20 years old) and does not meet the specialized requirements of the woodpecker. In addition, this species is thought to be extirpated from this area. Based on the lack of habitat meeting their requirements within or adjacent to the Project Area and lack of recently-documented presence nearby, these two bird species are not expected to be present in the Project area.

Insects

The beetle *Batrisodes specus*, which has a state rank of S1, is an obligate cave-dweller. No caves are known to occur in the Project Area. Based on the lack of habitat meeting its requirements within or adjacent to the Project Area, this beetle is not expected to be present in the Project Area.

Aquatic Organisms

An abundant and diverse community of mussels and other invertebrates historically occurred in the Tennessee River in the vicinity of the Project Area. The impoundment of the river to form Pickwick Reservoir altered the riverine habitat and adversely affected many aquatic organisms. Of the rare aquatic species with recorded occurrences within 5 miles of the Project Area, the majority of listed mussel species, as well as Anthony's river snail and the other nine snails that have a Natural Heritage state rank of S1 or S2 but no listing status, are adapted to flowing riverine habitats provided historically or currently by the Tennessee River. Some of the invertebrates potentially could occur within tributaries of the reservoir, including Mulberry Creek, which flows through the southeast corner of the Project area as it drains north into the reservoir. As noted in Table 3.4-1, several of the listed aquatic species are within the vicinity of the Project Area because they have been reintroduced to the free-flowing reach of the Tennessee River below Wilson Dam and upstream of the Project Area and associated tributaries. These reintroduced populations are federally listed as endangered elsewhere but are classified as non-essential, experimental populations in this reach of the river.

The hellbender is a large, completely aquatic salamander that prefers shallow, fast-flowing, rocky streams with a substrate of large, irregularly shaped rocks. The creeks in the Project Area do not appear to provide this habitat, and the hellbender is not expected to inhabit these creeks.

The pale salamander, one of two subspecies of the Tennessee cave salamander, is a completely aquatic salamander that lives in pools or streams within caves. The water in which it lives is usually clear and free of sediment, and the substrate may be rock, gravel, sand, or mud (AmphibiaWeb 2019). No caves with subterranean pools or streams are known to occur in the Project Area, so this salamander is not expected to be present in the Project Area.

The spotfin chub inhabits large creeks to medium-size rivers with moderate to swift currents over boulder substrates in upland areas. It has not been found in the vicinity of the Project area since 1937, before the Tennessee River was impounded. The bandfin darter inhabits pools with gravel or sand bottoms in low- to high-gradient creeks and small to medium rivers. The snail darter occurs in large streams and rivers with moderate current over substrates of gravel and sand. Its only confirmed location in Alabama currently is in Jackson County in the northeast corner of the state. The Alabama cavefish and southern cavefish inhabit subterranean pools of caves. No caves with subterranean pools are known to occur in the Project Area, and the Alabama cavefish is currently known to exist only within Key Cave in Lauderdale County (USFWS 2017). Based on the lack of habitat meeting their requirements within or adjacent to the Project Area, these four fish species are not expected to be present in the Project Area.

Plants

Two plant species with a federal listing status have recorded occurrences within 5 miles of the Project Area. The lyre-leaf bladderpod is a herbaceous annual that occurs in pastures, old fields, and roadsides in areas with limestone soils. The leafy prairie-clover occurs in prairie-like habitats on the edges of cedar glades. Based on the lack of these habitats within the Project Area, these two plant species are not expected to be present in this area.

Five plant species with a Natural Heritage state ranking of S2 (imperiled in Alabama because of rarity) but no federal or state listing status have recorded occurrences within 5 miles of the Project area. These species are discussed below.

Three-flowered hawthorn is a thorny shrub that occurs in habitats such as pine forest, gaps in hardwood forest, scrub, and prairie margins in the southern United States (eFloras 2019a). Three-flowered hawthorn has the greatest potential for occurrence on the Project Site within the shrub/scrub community along Mulberry Creek. This community is in an area that would be excluded from development.

Dutchman's breeches is a perennial herb that occurs in partial to full shade in deciduous woods and clearings with rich loam soils from New England to the Midwest and south to northern Georgia and Alabama (eFloras 2019b). It potentially could occur within tracts of deciduous forest in the Project Area.

False rue-anemone is a perennial herb that occurs in partial shade in moist deciduous woods of valleys, floodplains, and ravine bottoms, often on limey soils, and occasionally in open pastures, often in large colonies (eFloras 2019c). Given these habitat preferences, false rue-anemone has the greatest potential for occurrence on the Project Site within the forest community along Mulberry Creek. This community is in an area that would be excluded from development.

American columbo is a perennial herb that occurs in upland deciduous forest, especially near margins and clearings, from southern Canada to the southeastern United States (NatureServe Explorer 2019c). It potentially could occur within tracts of deciduous forest in the Project Area.

Alabama glade-cress is a perennial herb that occurs on limestone outcrops, cedar glades, pastures, abandoned fields, rocky knolls, and roadsides only in Alabama (eFloras 2019d). Based on its habitat preferences, Alabama glade-cress is unlikely to occur on the Project Site.

3.4.2 Environmental Consequences – Biological Resources

This section describes the potential impacts to biological resources under the No Action Alternative and the Proposed Action.

3.4.2.1 No Action Alternative

Vegetation

Under the No Action Alternative, there would be no impacts to the existing vegetation in the Project Area or the transmission ROW to the east as a result of actions related to the Muscle Shoals Solar Project. It is assumed that active farming, which is the predominant land use on the Project Site, and silviculture, in the central pine plantation, would continue. If these practices were to be discontinued and the current agricultural fields were left undisturbed, the vegetation community in these areas likely would transition gradually to an old field habitat of open grassland, shrubs, and young trees. If allowed to continue over the long term, succession likely would eventually lead to the development of a forest community similar to the existing forests of the affected environment described in Section 3.4.1.1. It is also assumed that vegetation within

TVA's existing Colbert Fossil Plant-Cherokee-Burns 161-kV transmission line ROW would continue to be maintained to prevent the growth of tall vegetation that would interfere with the ongoing operation of the line.

Wildlife

Under the No Action Alternative, impacts to wildlife would continue as under current land use. Current agricultural use of the majority of the Project Site and vegetation maintenance practices in the transmission ROW prevent the development of a diverse or abundant community of wildlife. Cycles of planting, maintenance of crop monocultures, and harvesting create physical disturbance and prevent a natural vegetation community that provides habitat usable by most native species. If current practices continue, the agricultural fields, ecotones, small forested tracts, and forested riparian areas would continue to support wildlife assemblages as described in Section 3.4.1.2. If these current practices were discontinued, the wildlife community over time would transition in conjunction with the vegetation community, shifting toward species that prefer old fields, shrub/scrub, and forest.

T&E and Other Rare Species

Under the No Action Alternative, no direct or indirect impacts to T&E or other rare species are anticipated. Current agricultural land uses over most of the Project Area do not support the habitat requirements of T&E or other rare terrestrial species native to the region, and this condition would continue. As discussed for vegetation and wildlife, habitats in the Project Area could be altered over time if current land use practices change. For example, a shift from agriculture could eventually result in more forest habitat suitable for T&E species such as bats. Aquatic habitats within the Project Site are limited and are surrounded by wooded buffers that minimize the potential for T&E or other rare aquatic species to be impacted by ongoing land uses under the No Action Alternative.

3.4.2.2 Proposed Action

Vegetation

Under the Proposed Action, a solar facility would be constructed on the Project Site, and an approximately 3.8-mile segment of existing transmission line would be upgraded, which would have direct impacts on vegetation in the ROW. Clearing and grading would be conducted to establish the new access roads, staging/laydown areas, concrete pads, substation, switch yard, and solar array field. The Project Site encompasses 2,432 acres, of which approximately 1,927 acres would be permanently affected by clearing and construction of facilities. Approximately 1,481 acres of agricultural fields, 232 acres of evergreen forest (predominantly pine plantation), 142 acres of deciduous forest, 44 acres of shrub/scrub, and 27 acres of herbaceous vegetation would be cleared where the PV arrays and other permanent facilities would be installed on the Project Site (see Figures 2-3 and 3.4-1). Approximately 3 acres of cropland would be temporarily disturbed for use as a laydown area during construction. Following construction, the solar facility would be maintained as described in Section 2.2.4 with a groundcover that is a mixture of grasses and forbs and is maintained to prevent the vegetation from growing taller

than about 2 ft. This would result in the long-term conversion of most of the Project Site from seasonal row crops or pine plantation to herbaceous vegetation maintained at a low height.

The activities involved in upgrading the existing 161-kV transmission line east of the Project Site would occur within the existing ROW, and additional ROWs would not be established, cleared, or developed outside the Project Site. The vegetation resources within the ROW would be temporarily impacted by vehicle access and associated activities required for the planned upgrades but would not be noticeably affected over the long term. BMPs would be employed to prevent soil erosion and related impacts on vegetation from temporarily accessing and working on these line modifications.

Construction would be sequenced to minimize the exposure time of the disturbed areas. Silt fence and other appropriate erosion controls, such as temporary cover, would be used as needed to minimize exposure of soil and to prevent eroded soil from leaving the work area. Disturbed areas including, but not limited to, road shoulders and reclaimed road sections, office/laydown areas, stormwater drainage basins, and other Project-specific locations would be seeded post-construction. A mixture of weed-free, low-growing, native grass seed obtained from a reputable seed dealer and in compliance with species recommendations of the local NRCS office would be used. If conditions require, soil stabilization by mulch or sprayable fiber mat could be necessary. If the area seeded is a steep slope, hydro seeding may be employed as an alternative. Hay mulch also would be utilized as needed. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has become well-established and soils on the Project Site are stable.

Direct impacts to forested areas would be minimal under the Proposed Action as most of the trees are located within the 50-ft buffer areas associated with waterbodies, wetlands, and the riparian zone along Mulberry Creek. An exception is the pine plantation in the middle of the Project Site, which would be cleared. Construction within these buffer zones would be avoided to the extent possible, but minor work could occur within the buffers. Several small stands of trees, mainly in the northwest portion of the Project Site, would be removed during the grading process. Additionally, minor impacts may occur if trees taller than 65 ft would shade the PV arrays and in locations where trees would interfere with the placement of a structure or a drainage basin.

Taking into consideration the large amount of similar habitat and land cover in the area locally and regionally, as well as the previously-disturbed nature of the Project Site, the clearing/grading of approximately 142 acres of existing deciduous forest, 232 acres of evergreen forest (98 percent pine plantation), and 44 acres of shrub/scrub and their conversion to herbaceous vegetation would have a minor impact. The impacted portions of the Project Site consist predominantly of recently cultivated agricultural land. These fields have been repeatedly cleared and revegetated with crops on a regular basis. Current species diversity and abundance are limited due to agricultural practices; however, the re-vegetation and seeding process after the installation of solar arrays could potentially increase the number of plant species on the Project Site. In addition, the land in much of the surrounding vicinity is used for very similar agricultural purposes. Therefore, the impacts of converting approximately 1,481 acres of

cropland to herbaceous vegetation would be relatively small and potentially beneficial with respect to the diversity and abundance of native grasses and other herbaceous vegetation that would be planted and maintained on the Project Site.

Indirect impacts on vegetation would be possible if the existing plant communities on the Project Site contributed to the regional propagation of particular species and regional genetic diversity. However, due to the very limited native vegetation on the Project Site, the lack of diversity and unique species, and the extensive amount of similar plant communities in surrounding areas, such an impact would not occur. The existing vegetation on the Project Site consists predominantly of planted crops and pine trees. These would be converted to a new type of plant community by seeding the areas of solar arrays with grasses and forbs, which would be maintained at a height less than 2 ft in order to prevent interference with the arrays. Thus, the Project Site would be vegetated year-round with early successional, maintained, herbaceous/grassland vegetation, resulting in a continuous cover of vegetation on area soils and impacts to regional plant communities that would be more beneficial than adverse. In the ROW, disturbed areas would be revegetated with herbs, and ongoing vegetation maintenance practices in the ROW would continue.

Wildlife

Direct impacts to wildlife under the Proposed Action are anticipated to be limited. The abundance and diversity of wildlife living on the Project Site where solar arrays would be installed are limited due to the agricultural activities in these areas historically and currently. Wildlife present at the time of construction would be disturbed, and mobile individuals would be displaced by construction activities. Disturbance, displacement, and direct mortality of individual animals likely would occur during the period when heavy equipment is used for clearing, grading, and excavation. Mobile animals, including birds, larger mammals, and some reptiles, can avoid such disturbances and move to safer areas. However, small, less-mobile animals, such as amphibians, turtles, and small mammals, are likely to be at much greater risk of mortality. Mortality of eggs and nestlings also could occur if they are present during the construction period. Although wildlife displaced by clearing activities and associated noise can find refuge in undisturbed habitats in the vicinity, temporary reductions in population could occur as a result of increased predation and competition in these habitats. The effects from clearing and installation of facilities also would occur on a smaller scale in localized areas off the Project Site along the transmission ROW where facility upgrades would occur. Effects within the ROW would be particularly limited because the disturbance would be temporary and within an existing ROW in which vegetation already is maintained and habitat is disturbed.

Following the completion of construction and revegetation, species adapted to grassland, herbaceous fields, and ecotones between the fields and forests would likely reoccupy most of the affected areas. Most of the species that currently utilize the agricultural fields and ecotones on the proposed Project Site would be well-adapted to the herbaceous community that would be established in the areas of solar arrays. Minor shifts in species composition may occur due to the change in disturbance regime and the shift to periodically mowed grass and herbaceous fields. Species occupying the wooded areas to be cleared would be permanently displaced.

Other than the central pine plantation (234 acres) that would be cleared, the other wooded areas that would be cleared (totaling 147 acres) are small and highly fragmented, limiting the numbers and diversity of the wildlife they support. They also make up a very small portion of the forested habitat in the vicinity of the Project Site. A forested riparian zone would be retained along Mulberry Creek in the southeastern portion of the Project area, and the clearing of the relatively small forest fragments that would occur in the interior portions of the Project area would not result in a substantial increase in forest fragmentation or impede the movements of terrestrial wildlife.

Although it is possible for both birds and bats to collide with PV panels and other structures, resulting in injury or mortality, the likelihood and significance of such potential collisions would be minor. The low height and lack of rapid movement of the panels is likely to minimize the potential for birds and bats to collide with the panels. Accordingly, direct impacts on migratory birds and bats after the installation of facilities under the Proposed Action are anticipated to be minimal.

Overall, direct impacts on wildlife in the Project Area would be minor. These impacts would be minimized by the ability of mobile species to colonize similar habitats surrounding the Project Area and to recolonize the Project Area after the completion of construction and revegetation. The habitat acreage that would be permanently lost would be a small component of the accessible, undeveloped habitat in the vicinity to which animals can disperse with minimal effects on populations. Indirect impacts from displacement of individuals and temporary disturbance due to construction activities and associated noise also would be very minor because displaced wildlife would colonize similar habitats that are abundant in adjacent areas.

T&E and Other Rare Species

Under the Proposed Action, federally listed T&E species are unlikely to be significantly affected. No federally listed species were observed during field surveys on or in the immediate vicinity of the Project Area. As described in Section 3.4.1.3, a team of scientists surveyed the Project Area for suitable bat habitat and completed habitat assessment forms wherever potential habitat was identified. The Phase 1 Habitat Assessment forms for potential bat habitat areas are included in Appendix E of the Natural Resources Report (Cardno 2019; Appendix G of this EA). Potential summer roost habitat for the Indiana bat and northern long-eared bat is present (seven potential roost trees) on the Project Site (Figure 3.4-1) within the riparian zone along Mulberry Creek. The riparian areas along Mulberry Creek would be excluded from clearing and the installation of solar arrays. However, a total of approximately 374 acres of trees would be removed in association with the Proposed Action.

No potential summer roosting trees for the Indiana bat or northern long-eared bat would be impacted. No suitable caves or karst features for federally-listed bats would be impacted. Therefore, no roosting habitat for the gray bat, Indiana bat, or northern long-eared bat would be impacted by the Proposed Action. The majority of the suitable foraging habitat for these species along Mulberry Creek would be avoided. However, the small forest tracts scattered within the Project area would be removed. Some of the ponds, streams, and wetlands may also be

impacted; however, jurisdictional streams, ponds, and wetlands would be surrounded by buffers and excluded from clearing and the installation of solar arrays. These features likely provide higher quality foraging habitat due to the increased amount of water they are likely to hold. While some lower-quality foraging habitat would be impacted, much of the higher quality foraging habitat would remain intact following the Proposed Action. BMPs would be used around retained bodies of water to minimize the potential impacts of herbicides and sedimentation. With the use of BMPs, avoidance of the higher-quality foraging habitat, and similarly suitable foraging habitat in the surrounding landscape, the Project would have no measurable effect on foraging bats.

Tree clearing would be conducted only during the winter window (October 15 – March 31) when federally and state-listed bats, as well as the tricolored bat, are not present on this landscape. Based on the limited dependence of these bats on the Project Area for foraging habitat and the ability to avoid direct effects on bats in occupied roosting trees based on the timing of tree clearing activities, there would be essentially no impacts on the gray bat, Indiana bat, northern long-eared bat, or tricolored bat. Suitable habitats for terrestrial T&E species other than bats are not present in the Project Area, the ROW to the east, or the immediate vicinity. Suitable habitats for aquatic T&E species are not present in the Project Area but may be present in the vicinity. Mulberry Creek, which crosses and receives drainage from the Project Area, Malone Creek, which receives drainage from the northwest corner of the Project Area, and Cane Creek, which is crossed by the transmission line to be upgraded east of the Project Area, potentially provide habitat for some of the aquatic T&E species in Table 3.4-1 (i.e., certain mussels and Anthony's river snail). These creeks and their tributaries would be protected from impacts such as sedimentation or runoff from selective herbicide applications by the use of BMPs to prevent erosion during and after construction and the maintenance of wooded riparian buffers of 50 ft or more around streams. The herbaceous vegetation cover to be established beneath and around the solar arrays is expected to further reduce the potential for erosion and sedimentation compared to the erosion potential of soils that are periodically tilled and exposed for crop cultivation. These measures would minimize impacts to water quality within and downstream of the Project Area, thereby protecting T&E invertebrates as well as aquatic insects that, in their adult phase, are food for T&E bats foraging over streams, lakes, and ponds.

3.5 VISUAL RESOURCES

3.5.1 Affected Environment – Visual Resources

Visual resources are the visual characteristics of a place and include both natural and man-made attributes. Visual resources are important as they can determine how an observer experiences a particular location. For example, an agricultural setting would elicit very different feelings in an observer than a manufacturing plant or an industrial area. Visual resources are very important to people living in the area, people going through an area, and in the context of historical and culturally significant settings. The experience of a historically significant building can be severely altered if the surrounding visual character is changed. A viewshed is defined as the environment that can be seen from a certain vantage point; a viewpoint is the vantage point from where the visual character is seen.

The Project area is near the Town of Cherokee. The regional character is mostly rural, with agricultural fields, rolling hills, forested areas, and generally small towns. Attributes associated with the Town of Cherokee would include many single-family homes with yards and trees, a central road with small shops and businesses, schools with large grounds and athletic areas, and small single-lane roads leading into the more spread out residential areas and then on to the rural areas. The town appears nestled in the midst of a peaceful and harmonious landscape of undulating hills covered in the soft natural tones of agricultural fields and forested areas on both the hill tops and valleys. Approximately 10 miles to the east of the Project Site is a more urbanized city, a larger highly developed area which includes Muscle Shoals, Tuscumbia and Sheffield. Figure 3.5-1 shows the locations where each photograph was taken.

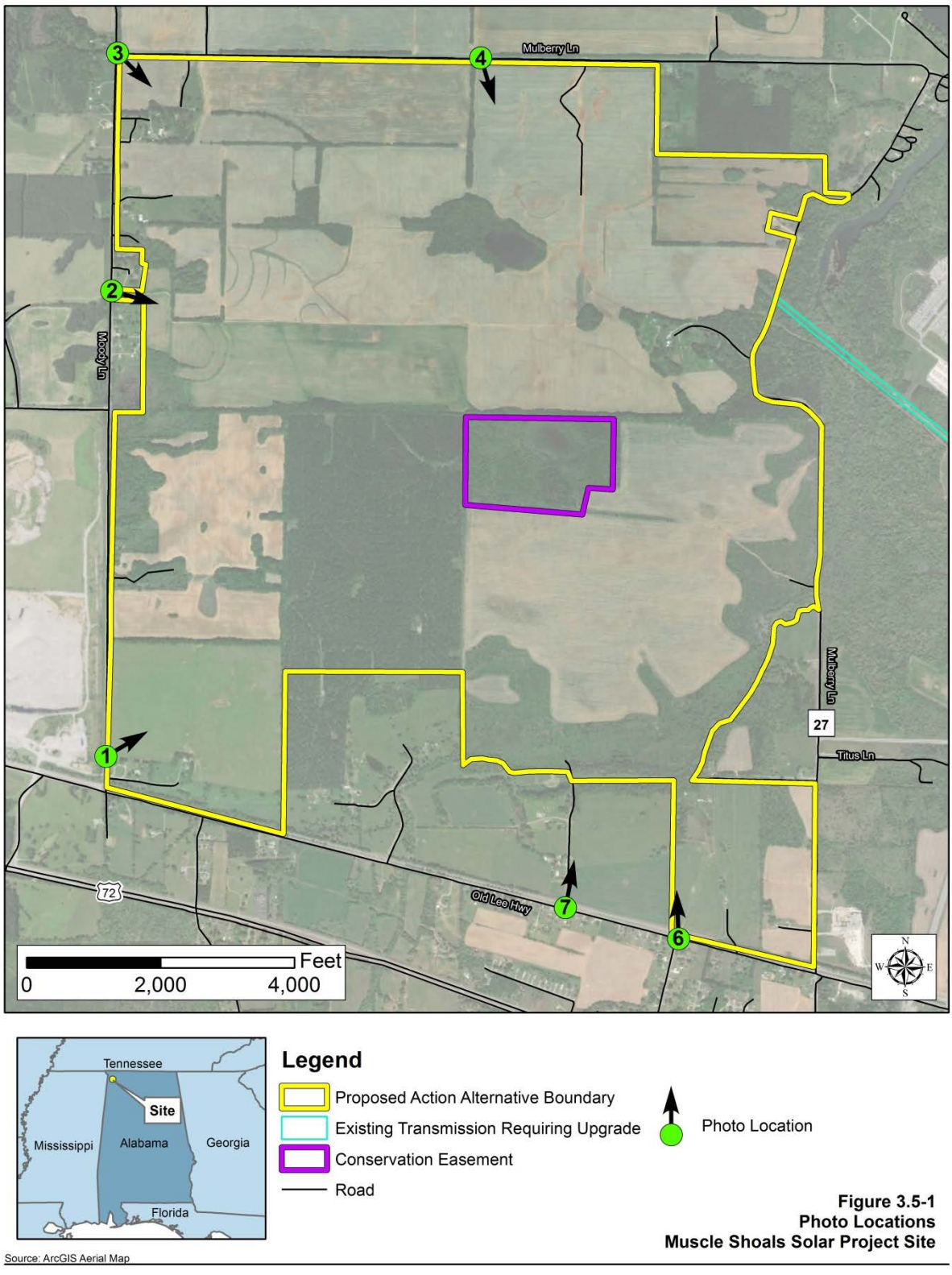


Figure 3.5-1. Photo Locations

The Project Site is mostly agricultural land, with actively farmed and small shrubby and forested areas present. The viewsheds constitute an almost completely agricultural setting, with very few man-made attributes. Man-made items include homes on adjoining properties, some residences, farm equipment buildings on-site, and paved and dirt roads traversing the parcel. Overall, in the Project vicinity, man-made items are generally tucked into forested areas or are mostly visually unobtrusive (Photo 3.5-1). For example, during the summer, this home would be mostly hidden by the surrounding trees.

Photo 3.5-1. Location 3 view of the Project Site and a residence

The Site has a gentle undulating topography reminiscent of pastureland. The natural color tones and unobtrusive man-made visual disturbances can create a feeling of harmony and tranquility (Photo 3.5-2). Although the uniformity of the croplands is a man-made visual disturbance, it is still an appealing view due to the colors and topography. The more open areas adjacent to the forested areas present an attractive contrast of colors and shapes. The majority of the Project Site is agricultural with small stands of trees following the ephemeral streams between fields. Due to the farming practices, visual appearance will vary over the year; some areas will appear disturbed and weary when the crops have been harvested. Photo 3.5-2 also illustrates the appearance of a harvested field on the Project Site.

Photo 3.5-2. A view of the Project Site, illustrating the rolling hills and forested areas

Photo 3.5-3 illustrates visual characteristics on the Site when the fields are in the growing stages and/or are left fallow and mowed. During this portion of the agricultural process, the view would feel more like a natural setting, with green rolling hills and trees in the distance. Additionally, the photo shows some of the man-made attributes of the viewscape, including the railroad tracks which run east to west south of the Project area.

Photo 3.5-3. Location 7 view of the project area showing mowed pasture-like areas, a wind mill and the railroad tracks

As a consequence of the active agriculture on the Project Site, an industrial aspect is inserted into the aesthetics of the Site. Additionally, the quarry located immediately west of the Project Site and the railroad tracks to the south also impart an industrial aspect to the general aesthetics of the location. Photo 3.5-4 shows the quarry and a portion of the train tracks.

Photo 3.5-4. A view of the adjacent quarry and train tracks

There are few residential viewpoints for the Project Site as few residences are in the immediate vicinity. The Site is largely visible from Old Lee Highway on the southern boundary and less so from Mulberry Lane on the eastern and northern boundaries and Moody Lane on the western boundary. Residences along these roads are mostly shielded from a view of the Project Site by road-side trees and the train tracks. The Alabama Department of Transportation (ALDOT) does not take traffic counts along Old Lee Highway or the other smaller roads in the vicinity. However, they do take counts on SR 72 which indicated that between 8,000 and 10,000 cars traveled this road daily in 2017. As a major road is nearby, it is likely that persons traveling the area by vehicle would take SR 72 instead of Old Lee Highway to travel to and from the greater Muscle Shoals area (ALDOT 2019a).

3.5.2 Environmental Consequences – Visual Resources

This section describes the potential impacts to visual resources should the No Action or the Proposed Action Alternatives be implemented. For this analysis, the construction and operation phases are treated separately as construction would be temporary and have different visual impacts from the longer-term operation phase.

3.5.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and associated structures would not be constructed; therefore, no Project-related impacts to visual resources would result. Existing views would be expected to remain unchanged from the present mix of farmland, small forested areas, and single-family residences. Impacts to visual resources are possible as the Town of Cherokee grows and land use changes to residential development. Additionally, visual changes

may occur over time as vegetation on the Project Site changes. For example, if the land is no longer mowed or farmed, vegetation would change from low profile plants to bushes and trees.

3.5.2.2 Proposed Action

Visual concerns are often associated with both large- and small-scale solar facilities. Construction on the Project Site would convert farmland, small buildings, and scrubland, which has been actively cultivated for many years, to a commercial/industrial land use type. During the March 2019 site visit, the AECOM field team assessed the potential for visual impacts from the Proposed Action on the Project Site. In advance of arriving on-site, AECOM prepared a visibility assessment of the Project area, which identified the surrounding areas from which the Project could be visible (assuming a conservative maximum tree height of 30 ft). Although the panels would be visible from the immediate surrounding area, which is sparsely populated, the solar facility would not be visible from the Natchez Trace Parkway, located approximately 3 miles northwest of the Project Site due to distance, topography, and intervening vegetation and structures.

Large portions of the Site are visible from Old Lee Highway (the southern boundary of the Site shown in Figure 2-2). The topography of the area is generally flat with areas of gently rolling hills, but the relatively stable elevations and tree-lined drainages/site boundaries prevent the Site from being seen from most other vantage points. Generally speaking, the majority of the western boundary of the Site is tree-lined with small pockets of visibility to the corn and cotton fields beyond the trees. Areas without trees in between include the quarry and a few residences on the northwest corner of the Project Site. This roadway, Moody Lane, is not a heavily-trafficked roadway; therefore, the potential change in viewshed from agricultural to industrial would not be expected to result in major adverse impacts. Similar conditions exist on the eastern boundary of the Project Site (i.e., Mulberry Lane); however, this road is more heavily forested (i.e., natural visual buffer) and the Project Site along this portion of the boundary includes several potential exclusion areas (i.e., areas that will not be developed). The northern boundary is another portion of Mulberry Lane, which is more sparsely populated than the other boundaries. Adjacent residences along this road are screened from the Project Site by trees on their own land.

The construction stage of the Proposed Action would create changes to the visible environment of the Project area. During construction, heavy machinery would be present, changing the visual aspects of the Project Site, which is now an agricultural landscape with few man-made items visible. Additionally, vegetation would be removed or trimmed, and part of the Site would be graded, changing the contouring, coloring, and texture of the scenery attributes. Much of the Project Site during construction would appear a mixture of browns and grays due to earthmoving and concrete activities. Water would be used to keep soil from aerosolizing; therefore, dust clouds are not anticipated. These visual impacts would be most noticed from Old Lee Highway and the residences immediately south of the Project Site. Due to the terrain and the large amount of agricultural land in the immediate vicinity, construction and operation of the Proposed Action would be visible from up to 1 mile away. Because the area is very sparsely populated, visual impacts during construction would be minor.

Indirect impacts to visual resources around the Project Site may occur due to increased traffic and movement of heavy machinery throughout the Site and along local roads. Overall, there would be minor temporary direct and indirect impacts to visual resources during the construction phase of the Proposed Action. Construction machinery and vegetation removal would change the views from a natural landscape to an active construction-site. However, these impacts are considered minor as they would be temporary (less than one year) and there are few onlookers in the vicinity that would be affected by the appearance of the activities.

During the operation phase of the Proposed Action, minor visual impacts would continue to occur. Natural re-vegetation would be allowed to occur around the panels, and vegetation would be managed. New electrical lines would continue to be visible and dirt roads would be apparent throughout the solar facility. Chain-link security fencing topped with barbed wire would surround the panel arrays. Photo 3.5-5 shows typical solar panel arrays.

Photo 3.5-5. Single-axis, tracking photovoltaic system with panels close to maximum tilt

Visually, the PV panels would be dramatically different from the current scenery on the Site. AECOM visited the perimeter of the Site and captured photographs from accessible boundaries. As part of the visual resource analysis, AECOM created renderings of what the PV solar power plant would look like from four vantage points along Old Lee Highway, Moody Lane, and

Mulberry Lane. No key observation points (i.e., specific locations associated with sensitive receptors from which the Project would be visible) were identified during the viewshed analysis. Figure 3.5-1 shows the visual rendering baseline photo locations. Photos 3.5-6 through 3.5-13 show the baseline photos and renderings of the likely appearance of the PV panels from these photo locations.

Photo 3.5-6 shows the appearance of the Project Site from a vantage point near the southwest corner of the Site, along Old Lee Highway (Photo location 1 on Figure 3.5-1). The view is of a mowed field or pasture area. The grass is green and there are green trees in the background, lending a soft and lush appearance to the scene. Photo 3.5-7 is a rendering of what the Project would look like if constructed. The panels are geometric and regular, giving the view an industrial appearance. The trees in the background are no longer visible, adding to the industrial aspect. This rendering represents what the Project Site would potentially appear like sometime after construction, as the grass is shown growing under the panels.

Although the Site would be maintained to prevent herbaceous growth of more than 2 ft in height, plant growth would presumably occur under the panels. As shown in the rendering, after the growth of these plants, the greenery under the panels would blend with the greenery of the surrounding area, giving the view a somewhat more natural aspect. The geometry of the panels would remain; therefore, the Site would always retain its new industrial aspect, even with the softening effect of the vegetation. The chain link fence with barbed wire adds to the industrial aspect, but from this angle it is not visually intrusive due to the similarity of the height of the fence and the PV panels themselves. This portion of the Project Site is adjacent to the quarry and is already industrial in nature. Additionally, since there are very few residences in this location, changes to the visual nature of this space would mostly be seen only by those traveling along Old Lee Highway and Moody Lane.

Photo 3.5-6. Location 1 view of the Project Site from the northwest corner along CR 217

Photo 3.5-7. A rendering of the Project's post-construction appearance from the vantage point of the previous photo (3.5-6)

Photo 3.5-8 shows the Project Site from Moody Lane looking east towards the Project Site (Photo Location 2 on Figure 3.5-1). The scene shows a single family residence and agricultural fields in the background. There are additional trees and slightly rolling hills in the far distance as well. The effect is driving down a country road, with peaceful and calming scenery. This view is likely to change over time though, as seasonal crop changes would occur changing from greenery to brown disturbed earth until vegetation could re-grow. Photo 3.5-9 shows a rendering of the PV facility's appearance post construction. The view is industrial in nature, as from the previous vantage point on Old Lee Highway. From this angle, however, it is less severe as the chain link fence and barbed wire are visually less obvious. Grasses and forbs would eventually colonize the area between the panels and the fence. This greenery would soften the view and would tie the residence's trees to the trees in the distance, blending the panels with the surrounding visual attributes. As in the previous rendering, however, the panels would retain their rigidity and continue to appear industrial in nature over the operating time frame. Both renderings are from viewpoints that are not heavily travelled. Moody Lane is a small road and, due to its course, is not likely to be upgraded in the near future. Therefore, although the visual aspect of the Project Site would change from an agricultural scene to a more industrial view, it would not be seen by many travelers or residences along Moody Lane and therefore the visual

impacts would be minor. Additionally, for any existing occupied, residential structure within 200 ft of a solar panel where there is no existing vegetative buffer present, a vegetative buffer would be installed to create a screen for such residence. Installation of visual screening would further minimize this visual impact.

Photo 3.5-8. Location 2 view of the Project Site from Moody Lane looking east towards the Project Site

Photo 3.5-9. A rendering of the Project from the location of the previous photo (3.5-8)

Photo 3.5-10 was taken from the northwest corner of the Project Site, facing south on Mulberry Lane (Photo Location 4 on Figure 3.5-1). This photo shows a harvested corn field. There are undulating fields and trees in the distance as well. The scene is rural and pastoral, as in the previous photos. Photo 3.5-11 is a rendering of the proposed PV facility from the same location. Due to their geometrical design, the panels and the fence impart an industrial, man-made appearance which is juxtaposed with the rural and more natural setting on the other side of the road. As the panels are somewhat recessed from this vantage point, trees and greenery would likely still be visible in the distance while driving past the Project. Along this portion of Mulberry Lane, the Project would extend for approximately 1.5 miles. Driving past the solar facility would not take long, and the rustic country view would be restored once past it. There is a single residence on this portion of Mulberry Lane, and it is well set back from the road (approximately 1,600 ft); therefore, residents along this portion of the Project Site would not experience visual impacts.

Photo 3.5-10. Location 4 view of the Project Site from Mulberry Lane looking south toward the Project Site

Photo 3.5-11. A rendering of the Project from the location of the previous photo (3.5-10)

Photo 3.5-12 was taken from Old Lee Highway near its intersection with Mulberry Lane, to the south of the Project area (Photo Location 6 on Figure 3.5-1). It shows a fallow or pasture area, train tracks, and transmission poles. There are trees visible in the background, however, adding an organic quality to the view. Photo 3.5-13 shows a rendering of the Project from the same location. The panels present a more mechanized view of the field, but the trees are still visible above them in the distance. As with the previous renderings, when plants begin to grow in under the panels and between the fence and the panels, the view would become less industrial. The trees in the distance and the bushes along the side of the road would blend with the herbs and grass growing under and amongst the panels. Due to the distance from Old Lee Highway and the existing train tracks, the appearance of the panels would be a minor visual impact as the view is already somewhat industrial. Additionally, drivers passing the Project Site in either direction would soon be re-immersed in a rustic viewshed.

Photo 3.5-12. Location 6 view of the Project Site from Old Lee Highway just south of the Project Site

Photo 3.5-13. A rendering of the Project from the location of the previous photo (3.5-12)

Site-wide, after construction of the Project, the softly undulating intermittently green and brown agricultural landscape would be replaced by industrial highly geometric patterns. The viewshed would change from a peaceful natural setting to a manufactured and structured appearance. Observers from the various viewpoints would most likely not experience the same aesthetic qualities that currently exist. These impacts would be most severe along Old Lee Highway and Moody Lane. The gently rolling landscape currently present would be replaced by the angular and geometrically arranged PV panels. Although grading plans intend to maintain the general topography of the Project Site, the panels themselves would make the Site look flatter. The surface of the panels themselves would also alter the view, as the dark, almost black surfaces would provide some reflection of the sky and would not conform to the surrounding agricultural views which have softer tones and angles.

Overall, visual impacts during the operation phase of the Project would be moderate in the immediate vicinity, but minimal on a larger scale, due to a combination of changes to the visual attributes of the area, the visibility of the Project Site from up to 1 mile away, and the existing general local character. These impacts would be minimal, however, due to the sparsely populated immediate area, the trees along Old Lee Highway, Moody Lane and Mulberry Lane, and the gently undulating topography.

Figure 2-2 shows the site layout including the solar panels, drainage basins, conservation easements, the switch yard, and the substation. The switchyard and the substation would be located in the northeast corner of the Project Site. There are no public roads in this area; therefore, visual impacts are not anticipated for the general public. Farmers harvesting or planting fields in the area may see these features temporarily while driving on the adjacent farmlands. This corner of the Project has trees associated with the stream running along the eastern property boundary towards the Tennessee River. There are also trees on the northern side of the corner. These trees would screen the switchyard and substation from most angles, other than from within the Project boundary and immediately under the existing transmission line. Therefore, given that very few people would be expected to experience the view of these structures, adverse visual impacts associated with the substation and upgraded transmission line would not be anticipated.

On-site drainage basins would be constructed throughout the Project Site to temporarily store stormwater and slowly release it. Although site layout designs have not been finalized, Figure 2-2 presents the proposed location of several small on-site drainage basins. One of the proposed drainage basins may possibly be seen on the northeast corner from Mulberry Lane. The remainder of the basins are more internal on the Project Site and would not be visible. The appearance of the basins would approximate small ponds that are already located on and around the Project Site. Since they would be recessed and are proposed to be allowed to revegetate along the edges post-construction, the basins would not create an unwanted visual disturbance. Rather, they would appear as basins surrounded by bushes and reeds in a clearing, with the panels in the distance. Therefore, no impacts to visual resources due to the basins would occur.

Overall, impacts to visual resources in the Project vicinity would be minor due to the small number of available observers, the rolling nature of the topography, and intervening vegetation which would act as a visual screen.

3.6 NOISE

This section provides an overview of the existing ambient sound environment in the Project area, and the potential impacts to the ambient sound environment that would be associated with the Proposed Action and No Action Alternatives.

3.6.1 Affected Environment – Noise

The area surrounding the Project Site is primarily rural residential, agricultural, industrial, or undeveloped land. It is sparsely populated with few residences close to the Project Site boundaries. There are numerous nearby industrial developments within 1 mile of the Project Site as described in Section 3.1.1, including a railcar manufacturer, quarry, paper recycling facility, and an industrial park that includes two paper products manufacturers. The Project Site is approximately 3 miles east of the Town of Cherokee.

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (such as community

annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by the EPA and has been adopted by most Federal agencies (EPA 1974). A DNL of 65 A-weighted decibels (dBA) is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction. The A-weighted sound level, used extensively in this country for the measurement of community and transportation noise, represents the approximate frequency response characteristic of the average young human ear. Areas exposed to a DNL above 65 dBA are generally not considered suitable for residential use. A DNL of 55 dBA was identified by EPA as a level below which there is no adverse impact (EPA 1974).

Noise levels occurring at night generally produce a greater annoyance than do the same levels occurring during the day. It is generally agreed that people perceive intrusive noise at night as being 10 dBA louder than the same level of noise during the day. This perception is largely because background environmental sound levels at night in most areas are about 10 dBA lower than those during the day.

3.6.1.1 Noise Regulations

The Noise Control Act of 1972, along with its subsequent amendments, delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Although there are no federal, state, or local regulations for community noise in Colbert County (other than within the Cherokee town limits), EPA guidelines recommend that DNL not exceed 55 dBA for outdoor residential areas. The EPA noise guideline is considered to be sufficient to protect the public from the effect of broadband environmental noise in typical outdoor and residential areas. 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 2009). The U.S. Department of Housing and Urban Development (HUD) considers a DNL of 65 dBA or less to be compatible with residential areas (HUD 1985). There are no local noise ordinances that apply to the Project Site.

3.6.1.2 Background Noise Levels

Noise levels continuously vary with location and time. 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.

In general, noise levels are high around major transportation corridors along highways, railways, airports, industrial facilities, and construction activities. Typical background day/night noise levels for rural areas range between 35 and 50 dB whereas higher-density residential and urban areas' background noise levels range from 43 dB to 72 dB (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.

The Project Site is predominately agricultural, residential, and undeveloped land. There are numerous existing sources of noise both within and near the Project Site. Ambient noise at the Project Site consists mainly of agricultural, transportation, rural, and natural sounds (e.g. farming equipment, moderate traffic, moderate voice, wind, wildlife, and similar sounds). Generally, noise levels in these types of areas range from 45 to 55 dBA. Nearby industrial businesses (quarry, manufacturing plant) to the west and east of the Project Site also generate noise due to ongoing operations, though most of this noise is not detectable at the Project Site.

Transportation noise, including road and rail traffic, exists in the immediate vicinity of the Project Site. An active commercial rail line is located directly south of the Project Site. A railroad crossing is located on Main Street, approximately two miles east of the Project Site's western boundary (CSX 2019). In accordance with U.S. Department of Transportation (DOT) Federal Railroad Administration (FRA) regulations, locomotive horns must be sounded in advance of all public highway-rail crossings except in established quiet zones (CFR 2019). The maximum volume level for the train horn is 110 dBs; the minimum sound is 96 dBs (FRA 2019). There are no set schedules for freight trains, as they operate in response to commercial demand for transportation. In addition to the horn, the sound of a passing train may be audible for miles.

For point of reference, approximate noise levels (measured in dBA) of common activities/events are provided below.

- 0 dBA - the softest sound a person can hear with normal hearing
- 10 dBA - normal breathing
- 20 dBA - whispering at 5 ft
- 30 dBA - soft whisper
- 50 dBA - rainfall
- 60 dBA - normal conversation
- 110 dBA - shouting in ear
- 120 dBA - thunder

3.6.2 Environmental Consequences – Noise

This section describes the potential impacts to the ambient sound environment should the Proposed Action or No Action Alternative be implemented.

3.6.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line upgrades would not be constructed, and no Project related impacts on the ambient sound environment would occur. Existing land use would be expected to remain a mix of farmland, unused land, and industrial; therefore, the ambient sound environment would be expected to remain as it is at present. As no changes to existing noise levels would be anticipated under this alternative, there would be no direct noise impacts. However, indirect impacts to noise levels in the vicinity of the Project Site are possible if the area becomes developed for residential or commercial purposes in the future.

3.6.2.2 Proposed Action

Direct and indirect noise impacts associated with implementation of the Proposed Action would primarily occur during construction of the Proposed Action. Typical construction equipment used for solar installation is presented in Table 3.6-1. Noise levels associated with these types of equipment are also listed.

Table 3.6-1. Proposed Construction Equipment

Equipment/Vehicle Type	HP*	Hours/ Day/ Vehicle	Miles/ Day/ Vehicle Round Trip	Daily Count in Peak Month	Daily Count in Average Month	Maximum Noise at 50 ft (dBA)
MOBILIZATION						
Off-Site Worker Commuter Bus, Small	220	1	50	1	1	84
Off-Site Worker Commute Car	140	1	50	48	48	55
Off-Site Water Delivery Truck	435	1	50	5	5	84
Off-Site Equipment/Material Delivery Truck	235	1	50	2	2	84
Generator	30	6	0	1	1	82
On-Site Pick Up Truck	235	8	20	3	3	55
On-Site Flatbed Delivery Truck	28	6	20	2	2	84
5000 gal Water Truck	240	8	10	5	5	84
On-Site Service Truck	235	4	20	1	1	55
On-Site Lube/Fuel Trucks	235	6	20	1	1	55
CIVIL IMPROVEMENTS - GRADING/ROADS/EARTHWORK						
Off-Site Worker Commute Car	140	1	50	132	112.8	55
Off-Site Water Delivery Truck	435	1	50	8	6.8	84

Table 3.6-1. Proposed Construction Equipment

Equipment/Vehicle Type	HP*	Hours/ Day/ Vehicle	Miles/ Day/ Vehicle Round Trip	Daily Count in Peak Month	Daily Count in Average Month	Maximum Noise at 50 ft (dBA)
Off-Site Equipment/Material Delivery Truck	235	1	50	2	0.8	84
Dozer Cat D6R	185	8	10	4	4	85
Generator	30	8	0	4	4	82
Scraper Cat 623	365	8	10	4	4	85
Deere 210LE Skip Loader	78	8	10	4	4	84
Cat 140H Grader	185	8	10	6	6	85
5000 gal Water Truck	240	8	20	8	8	84
Roller Vibrator/compactor/other	350	6	5	2	0.8	80
Cat BG600D Paver	173	6	5	1	0.4	85
On-Site Heavy Duty Pick Up Truck	210	6	20	4	4	55
On-Site Flatbed Delivery Truck	280	6	20	3	1.2	84
On-Site Lube/Fuel Trucks	235	6	20	6	6	55
On-Site Service Truck	280	6	20	4	4	55
On-Site Dump Truck	280	6	20	5	5	84
PLANT CONSTRUCTION						
Off-Site Worker Commuter Bus, Small	220	1	40	2	2	84
Off-Site Worker Commute Car	140	1	40	94	61	55
Off-Site Concrete Truck	300	1	40	4	3.5	85
Off-Site Equipment/Material Delivery Truck	235	1	40	6	6	84
Off-Site Equipment/Material Delivery Truck	235	2	100	4	4	84
Generator	30	8	0	2	2	82
Air Compressor	25	8	0	2	2	80
Dozer Cat D6R	185	4	10	1	1	85
Deere 210LE Skip Loader	78	8	10	3	3	84
Telehandler	99	8	10	4	4	84
Track Trencher	115	8	10	2	2	84
Cat 583T Pipelayer	310	6	10	2	2	84
On-Site Concrete Truck	350	8	30	0	0	85
On-Site Pick Up Truck	210	6	25	4	4	55
On-Site Heavy Duty Pick Up Truck	235	6	20	2	2	55
On-Site Flatbed Delivery Truck	280	6	25	4	4	84
On-Site Service Truck	210	6	25	3	2	55
On-Site Dump Truck	280	6	20	1	1	84
On-Site Lube/Fuel Trucks	210	6	25	2	2	55

Table 3.6-1. Proposed Construction Equipment

Equipment/Vehicle Type	HP*	Hours/ Day/ Vehicle	Miles/ Day/ Vehicle Round Trip	Daily Count in Peak Month	Daily Count in Average Month	Maximum Noise at 50 ft (dBA)
Pauselli 1200 Solar Pile Driver	64	10	1.5	4	2	75
SUBSTATION-BLDG-CONSTRUCTION						
Off-Site Worker Commute Car	140	1	40	38	38	55
Off-Site Equipment/Material Delivery Truck	235	1	40	0.5	0.5	84
On-Site Heavy Duty Pick Up Truck	235	6	20	1	1	55
On-Site Flatbed Delivery Truck	280	6	20	2	2	84
Generator	30	6	0	1	1	82
Air Compressor	25	6	0	1	1	80
Skip Loader	78	6	10	2	2	84
Crane - Boom Truck	250	6	10	2	2	85
TESTING & COMMISSIONING						
Off-Site Worker Commute Car	140	1	40	30	30	55
Off-Site Equipment/Material Delivery Truck	235	1	40	0.5	0.5	84
On-Site Heavy Duty Pick Up Truck	235	6	20	2	2	55
On-Site Service Truck	210	6	25	1	1	55
Cat BG600D Paver	173	6	5	1	1	85
Roller Vibrator/compactor/other	350	6	5	1	1	80

* - Horsepower (HP)
Source: DOT 2006

Construction equipment produces a range of sounds while operational. Construction noise would cause temporary and short-term adverse impacts to the ambient sound environment around the Project Site. As illustrated in Table 3.6-1 above, 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 types of 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, and to the recommended EPA noise guideline of 55 dBA at approximately 1,600 ft. However, this distance could be shorter in the field as objects and topography would cause further noise attenuation.

The nearest noise sensitive receptors are single family residences immediately adjacent to the Project Site primarily on its western and southern boundaries. Residents of homes, farmers, and livestock adjacent to the property boundary could experience elevated noise levels.

Construction noise is generally temporary and intermittent in nature as it generally only occurs on weekdays during daylight hours, which minimizes the impact to sensitive receptors.

Most of the proposed equipment would not be on-site and operating for the entire construction period but would be phased in and out according to the progress of the Project. The equipment most likely to make the most noise would be the pile driving activities during the construction of the array and building foundations. Standard construction pile drivers are estimated to produce between 90 to 95 dBA (calculated at a distance of 50 ft) at close range (DOT 2011). The specialty pile drivers proposed to be used for solar panel installation produce less noise (Table 3.6-1), and the piles supporting solar panels would be driven into soil with little to no rock drilling anticipated. Existing ambient noise would periodically include tractors and other farm equipment, train horns, and industrial noise. As construction would occur during the day, presumably when farm activities occur, there would not be a significant difference in noise levels other than during pile driving.

Area residences may experience small increases in noise levels during construction from an increase in construction-related vehicles along local roadways due to construction worker vehicles and equipment; however, these increases would be temporary and would occur primarily during the day during the morning and evening commute hours. Therefore, the noise levels generated by construction-related traffic would be minor and temporary.

Construction of TVA's Mulberry Creek switching station, in the northeast portion of the Project Site, and transmission components in the adjacent ROW would have similar impacts on noise levels. Pile driving equipment could be used to erect the transmission structures. This ROW area, however, is distant from any residence or other potential noise receptor. Therefore, impacts to noise due to construction in the ROW would be minimal.

Following completion of construction activities, the ambient sound environment would be expected to return to existing levels or below. The moving parts at the solar facility would be electric-powered and produce little noise. A typical inverter that would be used in the Project, such as a Power Electronics 3510kVA model, has noise levels of less than 79 decibels measured at 1 meter from the back of the unit (per PE FS3510M spec sheet). Noise levels will be considered in the configuration and placement of inverters such that noise from the Project would be consistent with existing background noise levels in the area when measured at the Project Site boundary. Consequently, the Proposed Action would have minimal effects on noise levels as a result of normal continuous operation. Periodic mowing would generate noise levels comparable to the operation of farm equipment.

Overall, implementation of the Proposed Action would result in minor, temporary, adverse impacts to the ambient noise environment for those residents living in proximity to the Project Site during construction and would result in no impacts during operation and maintenance of the solar facility.

3.7 AIR QUALITY AND CLIMATE CHANGE

This section describes an overview of existing air quality and GHG emissions within the Project area and the potential impacts on air quality and GHG emissions that would be associated with the Proposed Action and No Action Alternative.

3.7.1 Affected Environment – Air Quality and Climate Change

Air Quality Standards

Ambient air quality is determined by the type and amount (concentration) of pollutants emitted into the atmosphere, the size and topography of the air basin in question, and the prevailing meteorological conditions in that air basin. Through its passage of the Clean Air Act of 1970 (CAA) and its amendments, Congress has mandated the protection and enhancement of our nation's air quality. The EPA has established the National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants to protect the public health and welfare: sulfur dioxide (SO_2), ozone (O_3), 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), and lead (Pb).

The primary NAAQS were promulgated to protect public health, and the secondary NAAQS were promulgated to protect public welfare (e.g., visibility, crops, forests, soils, and materials) from any known or anticipated adverse effects of air pollutants. Primary and secondary standards are listed in Table 3.7-1 (EPA 2019b).

Table 3.7-1. National Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Level [a]
Ozone (O_3)	8-hour	70 ppb [b]
Particulate Matter ($PM_{2.5}$)	24-hour	35.0 ug/m^3
	Annual Mean	12.0 ug/m^3
Particulate Matter (PM_{10})	24-hour	150 ug/m^3
Carbon Monoxide (CO)	1-hour	35.0 ppm
	8-hour	9.0 ppm
Lead (Pb)	3-month	0.15 ug/m^3
Nitrogen Dioxide (NO_2)	1-hour	100 ppb
	Annual Mean	53 ppb
Sulfur Dioxide (SO_2)	1-hour	75 ppb
	3-hour	0.5 ppm

Notes:
[a] All of the standards are primary standards, which provide public health protection, except for the 3-hour SO_2 limit, which is a secondary standard and provides public welfare protection. Units of measure are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter (ug/m^3) of air.
[b] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
Source: EPA 2019b

Areas in compliance with the NAAQS are designated "attainment" areas. For areas EPA designates as *nonattainment*, there are several categories from *marginal* to *severe* that EPA could assign depending on the severity of the nonattainment. A *nonattainment* designation requires that a region submit a State Implementation Plan (SIP) that addresses how the NAAQS will be met in a future year. EPA later determines whether the region has met the SIP goals, and if so, EPA changes the designation from nonattainment area to *maintenance area*. The CAA General Conformity Rule requires that federal actions taking place in nonattainment areas conform to the region's SIP for reducing airborne concentrations of the nonattainment pollutant(s).

The State of Alabama adopted the NAAQS as the state ambient air standards and administers the delegable provisions of the CAA (ADEM 2019a). The rules for ADEM Air Pollution Control Program are found in Division 3 of the ADEM Administrative Code. Division 3 regulations include emission standards and control requirements on both a pollutant-specific basis and process/equipment/industry specific basis. Division 3 also sets forth the permitting requirements for air emission sources (ADEM 2017).

3.7.1.1 Regional Air Quality

The Project area is located in Colbert County, Alabama, part of the Florence-Muscle Shoals Metropolitan Statistical Area (MSA). Colbert County and the MSA are in attainment with applicable NAAQS and meet applicable federal and state air quality standards (EPA 2019b). The most recent available measurements of ambient air concentrations closest to the Project area shown in Table 3.7-2 are consistent with the above designation. Therefore, the Project is located in an area with good air quality.

The entire state of Alabama was declared in attainment for NAAQS pollutants by the EPA as of March 2014 (ADEM 2014). Colbert County was in non-attainment for SO_2 in 1992 but has been in attainment since 1993 (EPA 2019c).

Table 3.7-2 lists the pollutant concentration values from the air monitoring sites closest to the Project area in the MSA. These concentrations, which represent air quality near the Project area, are in the form used to determine attainment with NAAQS. The only NAAQS monitored in the MSA are Ozone and $PM_{2.5}$. The other NAAQS do not require monitoring due to EPA's set minimum requirements. The monitored pollutant concentrations are well below the standards.

Table 3.7-2. Air Quality in Florence – Muscle Shoals, AL

Pollutant		Concentration	Metric
Carbon Monoxide (CO)		NM (1)	2nd highest 1-hour measurement in the year
		NM (1)	2nd highest non-overlapping 8-hour average in the year
Lead (Pb)		NM (1)	Maximum of all rolling 3-month averages in the year
Nitrogen Dioxide (NO_2)		NM (1)	98th percentile of the daily max 1-hour measurements in the year
		NM (1)	Annual mean of all the 1-hour measurements in the year
Ozone (O_3)		0.056 ppm	4th highest daily max 8-hour average in the year
Particulate Matter (PM)	$PM_{2.5}$	16 µg/m^3	98th percentile of the daily average measurements in the year
		7.4 µg/m^3	Weighted Annual Mean (mean weighted by calendar quarter) for the year
	PM_{10}	NM (1)	2nd highest 24-hour average measurement in the year
Sulfur Dioxide (SO_2)		NM (1)	99th percentile of the daily max 1-hour measurements in the year
		NM (1)	Secondary 3-Hour Average Standard

(1) Not Monitored. ADEM does not monitor this pollutant because the Mobile Core Based Statistical Area (CBSA) does not meet the minimum monitoring requirements. Minimum monitoring requirements vary for each pollutant and can be based on a combination of factors such as population, level of traffic on nearby major roads, the level of monitored pollutants, and CBSA boundaries as defined in the latest US Census information.

Based on data from AQS as of May 8, 2018.
Source: EPA 2019d

Since the region of interest (ROI) area (Colbert County) where the Proposed Action is located is in attainment for all criteria pollutants, the CAA General Conformity rules would not apply to the implementation of the Proposed Action and a general conformity applicability analysis is not required. Average emissions in Colbert County of pollutants for which NAAQS have been established are presented in Table 3.7-3 for 2014.

Table 3.7-3. Average Emissions of NAAQS Pollutants in Colbert County for 2014

Pollutant	Emissions (tons per year)
Carbon Monoxide	20,256.22
Nitrogen Oxides (NOx)	12,635.06
PM_{10} Primary	8,486.71
$PM_{2.5}$ Primary	3,250.94
Sulfur Dioxide	22,158.05
Volatile Organic Compounds (VOC)	19,602.87

Note: Tier 1 sectors measured in Colbert County include Agriculture, Dust, Fuel Combustion – Comm/Institutional, Fuel Combustion – Electric Generation, Fuel Combustion –Industrial Boilers, Fuel Combustion – Residential, Industrial Processes, Mobile, and Solvent.
Source: EPA 2014

3.7.1.2 Regional Climate

Weather conditions determine the potential for the atmosphere to disperse emissions of air pollutants. Alabama's climate is characterized by warm, humid summers with average temperatures around 78 degrees Fahrenheit (°F) and cool winters with average temperatures around 46 °F (Current Results 2019a; Current Results 2019b). Precipitation is highest from November through May. Precipitation averages 54 inches per year. Huntsville, Alabama, approximately 75 miles east of the Project Site, averages 100 sunny, 101 partly sunny, and 201 total days with some sun per year (US Climate Data 2019). Western Alabama, including the area around the City of Florence, is vulnerable to tornados. Approximately 46 tornados occurred in 2018, close to its 30-year average of 47 per year (National Weather Service 2018).

3.7.1.3 Greenhouse Gas Emissions

GHGs are compounds found naturally within the earth's atmosphere. These compounds trap and convert sunlight into infrared heat. In this way, GHGs act as insulation in the stratosphere and contribute to the maintenance of global temperatures. As the levels of GHGs increase at ground level, the result is an increase in temperature on earth, commonly known as global warming. The climate change associated with global warming is predicted to produce negative economic and social consequences across the globe through changes in weather (e.g., more intense hurricanes, greater risk of forest fires, flooding).

The most common GHG emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The primary GHG emitted by human activities in the US is CO_2, representing approximately 85 percent of total GHG emissions. The largest source of CO_2 and of overall GHG emissions is fossil fuel combustion. CH_4 emissions, which have declined from 1990 levels, result primarily from enteric fermentation (digestion) associated with domestic livestock, decomposition of wastes in landfills, and natural gas systems. Agricultural soil management and mobile source fuel combustion are the major sources of N_2O emissions in the US (EPA 2019e).

3.7.2 Environmental Consequences – Air Quality and Climate Change

This section describes the potential impacts to climate and air quality should the Proposed Action or No Action Alternatives be implemented.

3.7.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line upgrades would not be constructed. Therefore, no air pollutants or GHGs would be generated by equipment or vehicles from construction or operation of the solar facility. Existing land use would be expected to remain a mix of farmland, undeveloped land, and industrial, and the existing habitat would be expected to remain as it is at present, with little effect on climate and air quality.

3.7.2.2 Proposed Action

Construction

Emissions on a construction site generally result from the engine exhaust of heavy construction equipment (e.g., bulldozers, dump trucks, pile drivers, etc.) powered by internal combustion engines, other motor vehicle exhaust, and fugitive dust. Emissions associated with the combustion of gas and diesel fuels by internal combustion engines would generate local emissions of particulate matter, NOx, CO, VOCs, and SO_2 during the construction period. Air quality impacts from construction activities would depend on both man-made factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture, and other factors. However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on off-site air quality, which would remain well below the applicable ambient air quality standard.

Fugitive dust emissions from earth-moving activities, the use of unpaved haul-roads and soil disturbance have the potential to lead to substantial amounts of airborne particulates (dust) that can negatively impact air quality. Approximately 1,927 acres of the Project Site could be subject to grading and/or ground-disturbing activities which have the potential to emit fugitive dust. In addition, grading activities result in soil disturbance that can make soils vulnerable to wind erosion. Properly implemented control and suppression measures, as well as BMPs (such as covered loads and wet suppression), greatly minimize fugitive dust emissions. In addition, standard erosion control measures, such as redistribution of removed topsoil and reseeding, would minimize the potential for wind erosion.

Overall, with adherence to regulations and BMPs, air emissions associated with the construction of the solar facility are expected to be minor. Emissions from construction would have, at most, a minor transient impact on air quality, which would remain well below the applicable ambient air quality standards. Therefore, the potential impacts to air quality associated with construction under the Proposed Action would be minor and temporary (lasting for a period of 12 months).

No indirect impacts to air quality or climate are anticipated from construction activities.

Operations

The operation of the proposed solar facility is not anticipated to have any adverse impacts to air quality or GHG emissions, as only minor maintenance would be expected to occur, which would not constitute a major source of air pollutants.

Conversely, overall pollutant emissions from the TVA power system would decrease during operations as the emissions-free power generated by the solar facility would offset power that would otherwise be generated, at least in part, by the combustion of fossil fuels. The solar facility would be part of the cleaner, lower-emitting generating portfolio described in the 2015 IRP (TVA 2015a) and would contribute to the approximately 44 percent reduction in CO_2 emissions projected between 2014 and 2033. While the reductions in air pollutants and CO_2 emissions attributable to the solar facility would be relatively minor, they would be a component

of TVA's projected significant overall reductions, the associated beneficial impacts to air quality, and the reduced impacts from climate change.

Agricultural practices, which currently raise dust and combustion byproducts, would be discontinued at the Project Site. Therefore, operations could ultimately result in a minor beneficial impact to local air quality.

3.8 CULTURAL RESOURCES

This section describes an overview of existing cultural resources within the Project area and the potential impacts on these cultural resources that would be associated with the Proposed Action and No Action Alternative. Components of cultural resources that are analyzed include prehistoric and historic archaeological and architectural resources.

3.8.1 Affected Environment – Cultural Resources

Cultural resources include archaeological sites, standing structures, objects, districts, traditional cultural properties, and other properties that illustrate important aspects of prehistory or history or have important and long-standing cultural associations with established communities and/or social groups.

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470) is specifically designed to address the effects of Federal and/or Federally-funded projects on both built resources (such as buildings, bridges, and levees) and underground (archaeological) resources. The NHPA provided for a national program to support both public and private efforts to identify, evaluate, and protect the nation's important historic and archaeological resources. These resources, collectively called "cultural resources," are evaluated for their eligibility for inclusion in the National Register of Historic Places (NRHP) maintained by the National Park Service. The NRHP is a list of buildings, districts, sites, structures, and objects significant to local, state, or national history and prehistory. Cultural resources may qualify for inclusion in the NRHP under one of four primary criteria:

- *Criterion A:* association with events that have made a significant contribution to the broad patterns of American history. This criterion includes literature, ethnic heritage, health/medicine, transportation, and many others.
- *Criterion B:* association with the life of significant persons. Examples of National Register properties nominated under *Criterion B* include George Washington's Mt. Vernon estate.
- *Criterion C*: embodiment of the distinctive characteristics of a type, period, or method of construction. This inclusion also includes the works of a master or buildings that possess high artistic value.
- *Criterion D*: cultural resources that have yielded or may be likely to yield information important in history or prehistory. This category is typically the most relevant criterion for archaeological resources.

Cultural resources that are listed, or considered eligible for listing, on the NRHP are called "historic properties." Federal agencies are required by the NHPA and by NEPA to consider the possible effects of their undertakings on historic properties. "Undertaking" means any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a federal agency, or is licensed or assisted by a federal agency. Considering an undertaking's possible effects on historic properties is accomplished through a four-step review process outlined in section 106 of the NHPA (36 CFR Part 800). These steps are:

1. Initiation (defining the undertaking and the area of potential effect [APE] and identifying the parties to be consulted in the process);
2. Identification (studies to determine whether cultural resources are present in the APE and whether they qualify as historic properties);
3. Assessment of adverse effects, if any (determining whether the undertaking would damage the qualities that make the property eligible for the NRHP); and
4. Resolution of adverse effects (by avoidance, minimization, or mitigation).

Throughout the process, the lead NEPA agency must consult with the appropriate SHPO, federally-recognized American Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking.

As part of the evaluation process for this Project, an archaeological survey and architectural survey were conducted to determine the presence of prehistoric and historic cultural resources that are listed on or potentially eligible for the NRHP. The APE consists of the approximately 2,474-acre Project Area and transmission line ROW for archaeological resources and the 0.5 mile radius surrounding the Project Site within the viewshed for historic structures. A cultural resources survey of archeological sites and historic structures was conducted within the respective APEs.

3.8.1.1 Previous Surveys

In December 2018, AECOM reviewed records of the Alabama State Site File and Report Archives at the Office of Archaeological Research, in Moundville, Alabama and the Historic Preservation Division of the Alabama Historical Commission in Montgomery, Alabama. Background research revealed five known archaeological resources within the survey area. Existing prehistoric sites 1Ct240, 1Ct247, 1Ct324, and 1Ct407 were recorded within the transmission line ROW during three previous surveys and 1Ct459 was recorded within the proposed boundaries of the solar array. Sites 1Ct240 and 1Ct247 (Hollis et al. 1989) and 1Ct407 (Hendryx and Hollis 1998) were determined to be ineligible for the NRHP. Site 1Ct324 is of undetermined eligibility; however, no further work was recommended at that site by the original investigators (Shaw and Ford 1993) due to a lack of intact deposits (all artifacts were found on the surface, no shovel tests were positive, and there was no evidence of erosion). Site 1Ct459 was recorded in the site files as being of undetermined eligibility for the NRHP. There were no previously recorded historic properties documented within the APE.

3.8.1.2 Survey Results

Fieldwork began with a windshield and pedestrian reconnaissance in December 2018 designed to evaluate the terrain, examine environmental features such as soils, ground cover, and drainage, and identify potential areas of previous disturbance. The reconnaissance provided the basis for refining the relative archaeological sensitivity of the Project area and establishing the research strategy. AECOM conducted an archaeological resources survey from December 15, 2018 through February 5, 2019; and March 28-29, 2019. The archaeological survey included field inspections of the Project area via visual examination of exposed ground surfaces and systematic shovel testing at 30 meter (100 ft) intervals. A structures survey was conducted of the Project footprint and the half-mile radius surrounding the Project during the week of January 21 by an architectural historian.

Archaeological Survey Results

AECOM identified 17 new sites during the archaeological survey. Additionally, AECOM revisited the mapped locations of the five previously recorded sites; AECOM was unable to detect evidence of the four previously recorded sites present in the transmission line ROW (1Ct240, 1Ct247, 1Ct324, and 1Ct407) during the current survey. AECOM did examine and find additional resources at 1Ct459 within the proposed Project Site. Of the 17 new sites AECOM identified during the archaeological survey, seven are recommended as potentially eligible for the NRHP. The remaining ten newly identified sites are recommended as not eligible and no further work is recommended. Table 3.8-1 presents a summary of the sites recorded and revisited during the current survey and the NRHP eligibility recommendations for each. AECOM also identified 78 isolated finds (IFs) within the proposed Project Site, but no IFs were identified in the transmission line ROW. All of the IFs are recommended as not eligible and no further work is recommended. Table 3.8-2 presents a summary of the IFs identified during the current survey and the NRHP recommendations for each (AECOM 2019). TVA has initiated consultation with the SHPO and federally-recognized Indian tribes with respect to the findings of the archaeological survey. Results of the consultation will be reported in the Final EA.

Table 3.8-1. Summary of Sites recorded and/or re-examined during survey and NRHP Recommendations

Site Number	Cultural Affiliation-Location	NRHP Recommendation
1Ct240	Indeterminate Prehistoric	Not Eligible
1Ct247	Indeterminate Prehistoric	Not Eligible
1Ct324	Indeterminate Prehistoric	Undetermined, no further work recommended
1Ct407	Indeterminate Prehistoric and Late 19th-Early 20th century historic house site	Not Eligible
1Ct459	Early Paleo-Indian to Early Archaic	Potentially Eligible
1Ct642	Indeterminate Prehistoric	Potentially Eligible
1Ct643	Late Archaic to Early Woodland and 19th to 20th Century	Potentially Eligible
1Ct644	Late Archaic to Early Woodland and 19th to 20th Century	Potentially Eligible
1Ct645	Middle Woodland and 19th to 20th Century	Potentially Eligible

Table 3.8-1. Summary of Sites recorded and/or re-examined during survey and NRHP Recommendations

Site Number	Cultural Affiliation-Location	NRHP Recommendation
1Ct646	Indeterminate Prehistoric	Potentially Eligible
1Ct647	19th to 20th Century	Not Eligible
1Ct648	Indeterminate Prehistoric	Potentially Eligible
1Ct651	Indeterminate Prehistoric	Not Eligible
1Ct652	Indeterminate Prehistoric	Not Eligible
1Ct653	Indeterminate Prehistoric	Not Eligible
1Ct654	Indeterminate Prehistoric	Not Eligible
1Ct655	Indeterminate Prehistoric	Not Eligible
1Ct656	19th to 20th Century	Not Eligible
1Ct657	Indeterminate Prehistoric and 19th to 20th Century	Not Eligible
1Ct658	Indeterminate Prehistoric and 19th to 20th Century	Not Eligible
1Ct659	Indeterminate Prehistoric and 19th to 20th Century	Not Eligible
1Ct662	Indeterminate Prehistoric and 19th to 20th Century	Not Eligible

Table 3.8-2. Summary of IFs recorded during survey and NRHP Recommendations

IF Number	Cultural Affiliation	NRHP Recommendation
IF001	Indeterminate Prehistoric	Not Eligible
IF002	Indeterminate Prehistoric	Not Eligible
IF003	Indeterminate Prehistoric	Not Eligible
IF004	19th to 20th Century	Not Eligible
IF005	19th to 20th Century	Not Eligible
IF015	19th to 20th Century	Not Eligible
IF016	Indeterminate Prehistoric	Not Eligible
IF017	Indeterminate Prehistoric	Not Eligible
IF018	Indeterminate Prehistoric	Not Eligible
IF019	Indeterminate Prehistoric	Not Eligible
IF020	Indeterminate Prehistoric	Not Eligible
IF021	Indeterminate Prehistoric	Not Eligible
IF022	Indeterminate Prehistoric	Not Eligible
IF023	Indeterminate Prehistoric	Not Eligible
IF024	19th to 20th Century	Not Eligible
IF026	Indeterminate Prehistoric	Not Eligible
IF032	19th to 20th Century	Not Eligible
IF033	Indeterminate Prehistoric	Not Eligible
IF034	Indeterminate Prehistoric	Not Eligible
IF035	Indeterminate Prehistoric	Not Eligible
IF036	Indeterminate Prehistoric	Not Eligible
IF037	Indeterminate Prehistoric	Not Eligible
IF038	Indeterminate Prehistoric	Not Eligible
IF039	Indeterminate Prehistoric	Not Eligible

Table 3.8-2. Summary of IFs recorded during survey and NRHP Recommendations

IF Number	Cultural Affiliation	NRHP Recommendation
IF040	Indeterminate Prehistoric	Not Eligible
IF041	Indeterminate Prehistoric	Not Eligible
IF042	Indeterminate Prehistoric	Not Eligible
IF043	Indeterminate Prehistoric	Not Eligible
IF044	Indeterminate Prehistoric	Not Eligible
IF045	19th to 20th Century	Not Eligible
IF046	Indeterminate Prehistoric	Not Eligible
IF047	19th to 20th Century	Not Eligible
IF048	19th to 20th Century	Not Eligible
IF051	19th to 20th Century	Not Eligible
IF053	19th to 20th Century	Not Eligible
IF055	Indeterminate Prehistoric	Not Eligible
IF058	Indeterminate Prehistoric	Not Eligible
IF059	Indeterminate Prehistoric	Not Eligible
IF085	Indeterminate Prehistoric	Not Eligible
IF088	Indeterminate Prehistoric and 19th to 20th Century	Not Eligible
IF089	Indeterminate Prehistoric	Not Eligible
IF090	Indeterminate Prehistoric	Not Eligible
IF091	Indeterminate Prehistoric	Not Eligible
IF092	Woodland and Indeterminate Prehistoric	Not Eligible
IF094	Indeterminate Prehistoric	Not Eligible
IF096	Indeterminate Prehistoric	Not Eligible
IF098	Indeterminate Prehistoric	Not Eligible
IF099	19th to 20th Century	Not Eligible
IF100	19th to 20th Century	Not Eligible
IF101	Indeterminate Prehistoric	Not Eligible

Architectural Survey Results

During the structures survey, no buildings were identified that are recommended as eligible for the NRHP. The historic architectural inventory identified 15 resources within the architectural APE that are 50 years old or older; 12 of these are single-family residences. The others include a commercial garage, a silo, and a cemetery. It is believed that all 15 recorded resources lack the integrity and/or significance required for NRHP listing. Table 3.8-3 summarizes the resources AECOM identified within the architectural APE (AECOM 2019). Additionally, the Oates Cemetery, which is located just outside of the architectural APE, was investigated by TRC Garrow Associates in 2001 and determined to be not eligible for the NRHP (TRC Garrow Associates 2002). TVA has initiated consultation with the SHPO with respect to the findings of both the architectural survey. Results of the consultation will be reported in the Final EA.

Table 3.8-3. Summary of Architectural Resources recorded during the Current Survey and NRHP Recommendations

Site Number	Description	Type/Style	Approximate Date (Tax Date)	NRHP Eligibility
Ct00001	Residence	Ranch (1-story, brick, hip-roof ranch)	1955-60	Not Eligible
Ct00002	Residence	Traditional (1-story, frame, gable-end, single-pile house)	1942 (tax)	Not Eligible
Ct00003	Harris Family Farm	Century and Heritage Farm: House (1-story, brick, hip-roof); House (1-story, brick, gable-end ranch); four pole-barn-type barns/sheds	1890-1910, 1960s, 1974	Not Eligible
Ct00007	Residence	Ranch (1-story, brick, hip-roof ranch)	1955-60	Not Eligible
Ct00008	Former Myrick's Garage	Commercial (gable-front, concrete-block, commercial garage with one service bay)	1950-55	Not Eligible
Ct00009	Residence	Ranch (1-story, brick, hip-roof ranch)	1966 (tax)	Not Eligible
Ct00010	Residence	Period cottage (frame, gable-end, 1-1/2-story, two-pile house)	1920-30	Not Eligible
Ct00011	Silo	Silo (concrete stave)	1945-1965	Not Eligible
Ct00012	Residence	Ranch (1-story, brick, hip-roof ranch)	1958 (tax)	Not Eligible
Ct00013	Residence	Ranch (1-story, brick, gable-end ranch)	1959 (tax)	Not Eligible
Ct00014	Residence	Traditional (4-bay, 2-pile, frame, pyramidal-roofed house)	1939 (tax)	Not Eligible
Ct00015	Residence	Ranch (1-story, brick, gable-end ranch)	1967 (tax)	Not Eligible
Ct00016	Watkins Cemetery	Cemetery (round- and basket-arched limestone and granite headstones; beveled concrete ledger stones)	ca.1918 to present	Not Eligible
Ct00017	Residence	Ranch (1-story, brick, gable-end ranch)	1969 (tax)	Not Eligible
Ct00018	Residence	Gable front (1-story, 4-bay, 2-pile, frame house)	1935-1955	Not Eligible

3.8.2 Environmental Consequences – Cultural Resources

3.8.2.1 No Action Alternative

Under the No Action Alternative, existing land use would be expected to remain unchanged. Ground disturbing agricultural practices at the Project Site would continue to have the potential to impact intact cultural resources at the surface or within the first 8 to 10 inches of soil.

Therefore, impacts to cultural resources associated with the No Action Alternative would be anticipated to be minor.

3.8.2.2 Proposed Action

Muscle Shoals Solar has identified archaeological resources within the Project APE, some of which are potentially eligible and others that are not eligible for the NRHP. All sites within the Project Area that were identified as potentially eligible would be avoided during the construction and operation of the Muscle Shoals Solar Project. Therefore, there would be no direct or indirect impacts to archaeological or historic resources potentially eligible for the NRHP. The TVA has initiated consultation with the SHPO and federally recognized Indian tribes with an interest in the area with respect to these findings of both the archaeological and architectural surveys. Results of the consultation will be reported in the Final EA.

Should previously undiscovered cultural resources be identified during Site construction or operations, a Secretary of the Interior qualified archaeologist and the SHPO will be consulted before any further action is taken.

3.9 NATURAL AREAS AND RECREATION

This section describes an overview of existing natural areas and recreation areas surrounding the Project Area and potential impacts to these areas associated with the No Action and Proposed Action Alternatives.

3.9.1 Affected Environment – Natural Areas and Recreation

Natural areas include managed areas such as Wildlife Management Areas, National Wildlife Refuges and Habitat Protection Areas, ecologically significant sites, and river segments listed in the Nationwide Rivers Inventory. Recreation areas provide recreational activities and opportunities to the public at the federal, state, or local level. Figure 3.9-1 shows natural and recreation areas within a 5-mile radius of the Project Site.

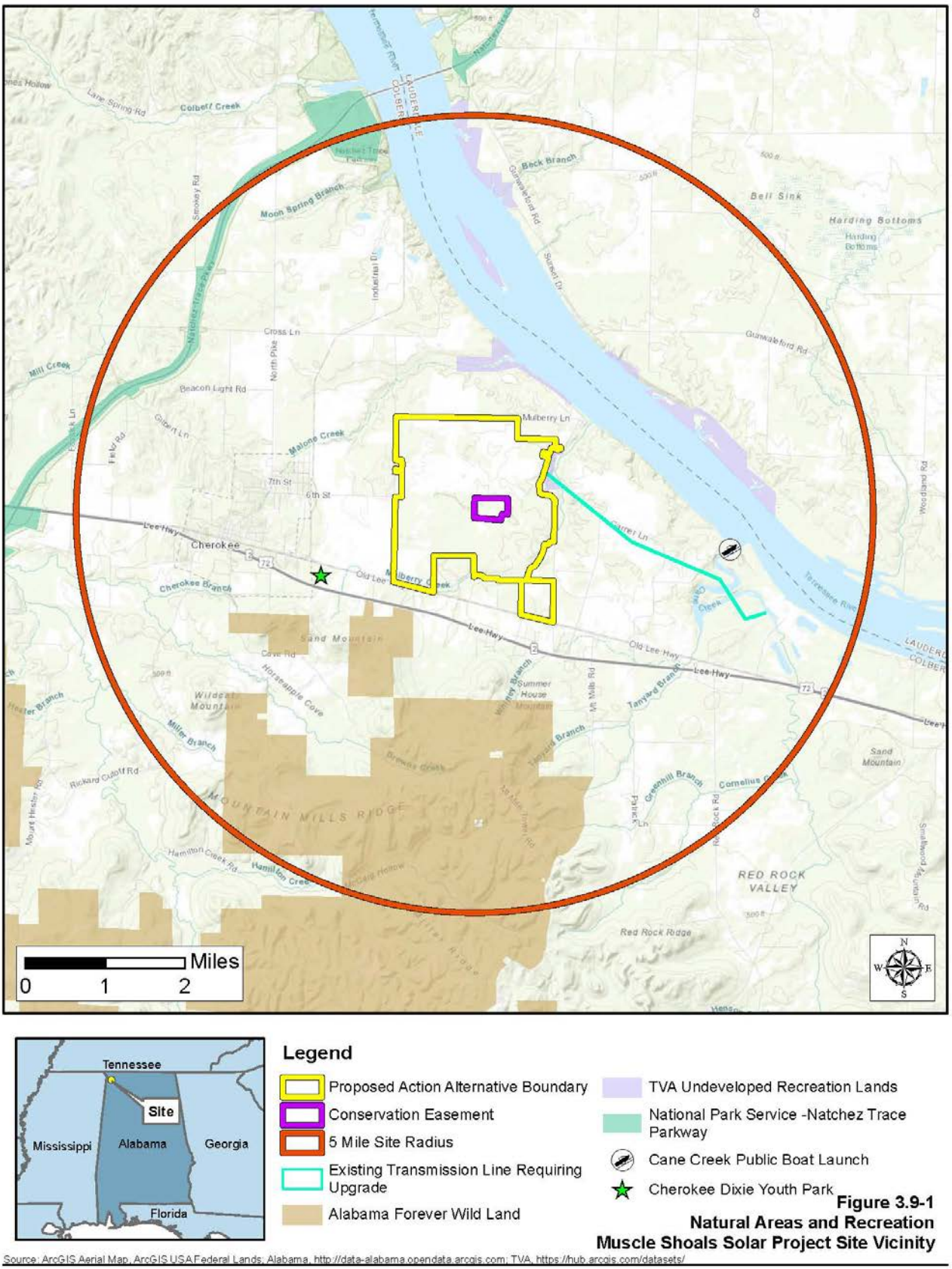


Figure 3.9-1. Natural Areas and Recreation

Since the parcels of property that make up the Project Site are privately owned and consist primarily of agricultural lands, there are no natural areas or recreation areas. Several parcels designated as "TVA undeveloped recreation lands" are located within a 5-mile radius of the Project Site adjacent to the TVA Pickwick Reservoir (Tennessee River). These parcels include areas containing sensitive resources (i.e., historical, archaeological, and visual significance) and areas used for natural resource conservation (i.e., important wildlife habitat and shoreline vegetation) (TVA 2019b). A portion of the Natchez Trace Parkway (National Park Service) is located to the northwest of the Project Site (TVA 2010). South of the Project Site are tracts of land that are part of the Alabama Forever Wild Land Trust (Freedom Hills Wildlife Management Area). These tracts are cooperatively managed by the Alabama Wildlife and Freshwater Fisheries Division and the State Lands Division to improve hunting related activities (Alabama Department of Conservation and Natural Resources 2019). There are also two developed outdoor recreation areas within 5 miles of the project, the Cane Creek Boat Ramp and the Cherokee Dixie Youth Park. The Cane Creek Boat Ramp is located approximately 2 miles east of the Project Site and the existing TVA Colbert FP-Cherokee-Burnsville 161-kV transmission line passes within .5 miles of the ramp. Cherokee Dixie Youth Park is located approximately 1 mile west of the Project Site boundary. Two other areas in the region of the Project Site but outside of the 5-mile radius are the Key Cave National Wildlife Area and the Seven Mile Island State Wildlife Management Area (TVA 2010). The Tennessee River (Pickwick Reservoir) provides numerous recreational opportunities such as boating and fishing.

3.9.2 Environmental Consequences – Natural Areas and Recreation

This section describes the potential impacts to natural areas and recreation areas should the Proposed Action or No Action Alternatives be implemented.

3.9.2.1 No Action Alternative

Under the No Action Alternative, the area within the proposed Project Site and vicinity would remain in its current condition. As a result, adoption of the No Action Alternative would not affect natural areas or recreation areas because no Project related activities would occur. While natural ecological processes and anthropogenic disturbances would continue, changes would not result from the proposed Project.

3.9.2.2 Proposed Action

Because Project related work would not produce any significant impacts affecting areas outside of the immediate Project Site, adoption of the Proposed Action would not have any direct or indirect impact on any natural areas or recreational areas within a 5-mile radius.

3.10 UTILITIES

This section describes an overview of existing utilities within and near the Project Site and the potential impacts on these utilities that would be associated with the No Action Alternative and Proposed Action. Specific utility components analyzed below include electrical service, natural gas, water supply, and communications.

3.10.1 Affected Environment – Utilities

Sheffield Utilities provides electricity, gas, wastewater, and water services in the City of Sheffield as well as the surrounding Colbert County areas. The Colbert County Rural Water System is the primary water supply for Colbert County. Cherokee Water & Gas also provides service in the vicinity of the Project Site.

3.10.1.1 Electrical Service

Electrical service to the Project Site is provided by Sheffield Utilities. TVA's existing Colbert FP-Cherokee-Burnsville 161-kV transmission line also traverses the northeast corner of the Project Site (Figure 2-1).

3.10.1.2 Natural Gas

Natural gas in the area is provided by North Alabama Gas District and Cherokee Water & Gas. North Alabama Gas District has a gas line crossing the Project Site in an easement that parallels the TVA 161-kV electric transmission line; it also has a line running from U.S. Highway 72 and up Moody Lane to an industrial site located to the north of the Project Site.

3.10.1.3 Water Supply

The Colbert County Rural Water System provides water to over 4,500 county residents and serves over 220 square miles of area from the Mississippi state line to the Lawrence County line. It includes over 370 miles of water lines, 9 pump stations, 7 elevated water tanks, one water treatment plant, and one waste water treatment plant. The water treatment facility produces water for customers in the western portions of the county but buys its water from other producers for customers that live in the eastern portions of the county.

Residences located within the Project Site are not connected to any municipal sewer system and all have individual septic systems.

3.10.1.4 Communications Resources

Communications resources (i.e., fiber/telecom) in the vicinity of the Project Site are provided locally by the Cherokee Telephone Company and Telephone Electronics Corporation, or TEC.

3.10.2 Environmental Consequences – Utilities

This section describes the potential impacts to utilities should the Proposed Action or No Action Alternatives be implemented.

3.10.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line would not be constructed; therefore, there would be no Project related impacts to utilities. Existing land use would be expected to remain a mix of farmland and undeveloped land, and existing on-site

utilities would likely remain unchanged, with the exception of potential upgrades and maintenance.

3.10.2.2 Proposed Action

Under the Proposed Action, TVA would connect the solar facility to the existing Colbert FP-Cherokee-Burnsville 161-kV transmission line that runs through the northeast corner of the Project Site using a line-tap and upgrading the existing transmission line from pole 24 to pole 50. An on-site Project Substation and one Switching Station would also be constructed in close proximity to each other in the northeast corner of the Project Site (Figure 2-2). Distribution-voltage retail electrical service to the Project Site is available from Sheffield Utilities; a service drop would be installed during construction to provide construction power. Once the Project enters the operation phase, Sheffield Utilities would provide the required back-up power for controls. Based on discussions with Sheffield Utilities, and given the low-level of retail electric demand needed, no changes to the Sheffield Utilities distribution system would be expected, and there would be no impacts to the local utility or its customers. Implementation of the Proposed Action would result in additional renewable energy resources in the region which would constitute a beneficial impact to electrical services in the region.

Water would be needed for soil compaction and dust control during construction and to a lesser extent for domestic use during operations (i.e., washing solar panels). There will be no habitable buildings on-site and no need for potable water. Portable toilets would be available on-site for the duration of the construction period; there would be no need for a septic system or connection to the closest sanitary sewer. Water in sufficient quantity and quality would be made available through use of on-site groundwater wells, or delivery via water trucks. Muscle Shoals Solar would determine daily water requirements based on the preliminary grading plan and size the new on-site wells accordingly. Muscle Shoals Solar will perform groundwater drilling and testing work prior to full construction to generate data on aquifer characteristics and develop a plan for the production well design. Between two to four on-site groundwater supply wells would be utilized for the Project (depending on flow capacity of each well). The exact location of the wells would be identified in the final design. The wells would be spaced around the Project Site to provide easy access for construction water and to reduce the potential for any significant water level drawdown. The well field would include a sufficient number of standby wells to provide water in the event the primary wells are shut down for maintenance.

Because conditions may change during the course of the Project, a final Decommissioning and Closure Plan would be submitted for review and approval based on conditions as of the time of facility closure. It is anticipated that the decommissioning and site reclamation would be staged in phases, allowing for a minimal amount of disturbance and requiring minimal dust control and water usage. It is anticipated that water usage during decommissioning and site reclamation would not exceed operational water usage.

Natural gas service would not be required during the construction or operation of the Project.

No communication resources are anticipated to be acquired through the local providers. Muscle Shoals Solar would have a dedicated communications system to remotely monitor the Project facility and operations. Additionally, to facilitate the operation of the solar site and transmission line connection, TVA proposes to also undertake the following additional activities:

Phase I activities

- Installation of fiber-optic OPGW on about 3.8 miles of the Colbert FP-Cherokee-Burnsville transmission line from the Muscle Shoals Solar interconnection to the Colbert FP Switchyard;
- Replacement of structures 26, 27, 40, 41, and 46 on the Colbert FP–Cherokee-Burnsville 161-kV transmission line to accommodate the installation of the OPGW;
- Installation of telecommunications connections at the Colbert FP and Burnsville substations and South Jackson and Tupelo 161-kV substations; and
- Modification of TVA system map boards to include names and numbers of the new transmission line and Muscle Shoals Solar Substation.

Phase II activities

- Installation of telecommunications connections at Mulberry Creek 161-kV Switching Station, Colbert FP and Burnsville substations, and South Jackson and Tupelo 161-kV substations; and
- Modification of TVA system map boards to include names and numbers of the new Mulberry Creek Switching Station.

These additions to the transmission lines or the existing communication system would not have an adverse impact to telecommunications in the local area.

Overall, no impacts to utilities would be anticipated as a result of implementation of the Proposed Action. No indirect impacts to utilities would occur under the Proposed Action.

3.11 WASTE MANAGEMENT

This section describes an overview of existing waste management within the Project Area and the potential impacts to waste management that would be associated with the Proposed Action and No Action Alternative. Components of waste management that are analyzed include solid and hazardous waste and materials.

3.11.1 Affected Environment – Waste Management

“Hazardous materials” and “hazardous waste” are substances, which because of their quantity, concentration, or characteristics (physical, chemical, or infectious), may present a significant danger to public health and/or the environment if released. These substances are defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. 9601 et seq.) and the Solid Waste Disposal Act, as amended by the Resource

Conservation and Recovery Act ([RCRA]; 42 U.S.C. 6901 et seq.). Regulated hazardous wastes under RCRA include any solid, liquid, contained gaseous, or semisolid waste or combination of wastes that exhibit one of more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or is listed as a hazardous waste under Title 40, CFR, Part 261. Storage and use of hazardous materials and wastes are regulated by local, state, and federal guidance including the Emergency Planning and Community Right-to-Know Act (42 U.S.C. 116 *et seq.*) and RCRA.

Currently, land use on the Project Site is agricultural or undeveloped. No known hazardous waste is generated on or stored at the Project Site. Petroleum products are stored and used on the Project Site as part of the current agricultural operations. Similarly, agricultural pesticides, herbicides, and fertilizers may have been stored and used on the Project Site.

In late 2018, as part of the property purchase evaluation process, Cardno, Inc. conducted a Phase I Environmental Site Assessment to establish the presence, former use, or spillage of hazardous substances or petroleum products on-site. They performed Site reconnaissance on the 27th of November 2018. The Phase I ESA noted multiple buildings on the Project Site that, because of their age, may contain asbestos or lead materials. The Phase I report also noted equipment and debris associated with the former agricultural use of the Project Site. However, this assessment concluded that, because lead and asbestos assessments would be performed before any demolition and because the intended use of the Project Site greatly reduces the potential for exposure to these environmental hazards, these environmental issues do not represent a significant environmental concern. This assessment revealed no recognized environmental conditions (RECs), controlled RECs, or historical RECs in connection with the subject property (Cardno 2018).

The Project Site is located in the town of Cherokee in Colbert County, Alabama. Solid waste in Colbert County is managed by the Shoals Solid Waste Authority and through the Colbert County government offices. The Colbert Household Garbage Collection Center, located at 201 N Main Street in Tuscumbia, Alabama, processes household garbage, paper, building type debris, trees and limbs, bagged leaves, mattresses, televisions, refrigerators, washers, etc. Tires, batteries, liquids, paints, and other hazardous materials, including bio-hazards, are not permitted, nor are construction or commercially generated debris. The county also provides residential garbage pickup for county residents at their residential dwelling through their White Goods Roadside Pickup Service (ADEM 2015a, ADEM 2015b, and Colbert County 2019).

There are two landfills in the area: The Shoals Solid Waste Industrial Landfill operated by the Shoals Solid Waste Authority and the privately-owned Cherokee Industrial Landfill. The Shoals Solid Waste Landfill is located next to the Colbert Household Garbage Collection Center, on Missouri Street just off Highway 157 in Tuscumbia, Alabama. The landfill encompasses 176 acres with an approved disposal area of 90 acres, almost 31 of which are closed. The landfill accepts nonhazardous industrial waste, approved industrial sludge, construction waste, demolition waste, asbestos, and tires from Colbert County at large, including all municipalities and industrial parks within the county. The maximum average daily volume of waste disposed

at the Shoals Solid Waste Industrial Landfill is 1,000 tons per day (ADEM 2019b, ADEM 2019c, EPA 2019f).

The Cherokee Industrial Landfill is located about 3 miles east of the Project at 1828 Cane Creek Road in Cherokee, Alabama. Operated by CWI Alabama, LLC out of Atlanta Georgia, this landfill is permitted to accept nonhazardous industrial wastes, approved industrial sludges, construction and demolition debris, asbestos, and tires from Alabama, Georgia, Mississippi, and Tennessee. This privately-operated landfill consists of 161.77 acres, with 56.35 approved for disposal. The maximum average daily volume of waste disposed at the Cherokee Industrial Landfill is 1,000 tons per day (ADEM 2018).

Recycling in the Cherokee, Alabama area is performed by numerous private businesses and by the Florence Recycling Department. Various private companies provide recycling services to businesses in the Cherokee, Alabama area, including Recycling Management Resources, located at 510 Mulberry Lane in Cherokee. Colbert County has recycling bins located throughout the county. The City of Florence has a residential curbside recycling program and will also pick up recyclable items from businesses. Additionally, the city recycling center, located at 1200 Terrace Street in Florence, is open 7 days a week for dropping off items. Recyclable items include cardboard, paper, aluminum, steel, #1 and #2 plastics, motor oil, and cooking oil (Waste Advantage 2018, Recycling Centers 2019, InfoFree 2019, City of Florence 2019).

3.11.2 Environmental Consequences – Waste Management

This section describes the potential impacts to waste management should the No Action or Proposed Action Alternative be implemented.

3.11.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line upgrades would not be constructed; therefore, no Project related impacts to waste management resources would occur. Existing land use would be expected to remain a mix of farmland and undeveloped land, and existing waste management conditions would be expected to remain as they are at present.

3.11.2.2 Proposed Action

Construction of the Proposed Action would result in the generation of hazardous and nonhazardous solid and liquid waste in the form of construction debris, grading spoils, wastewater, packaging materials, and general construction waste. Under the Proposed Action, every effort will be made to minimize the amount of solid and liquid waste generated during and after construction of the Project, including upgrades to the existing transmission ROW.

Materials suitable for soil compaction activities such as gravel and soils would be brought to the Project Site as needed and off-loaded at the designated road or building location for immediate dispersion. Materials unsuitable for compaction, such as mowed debris, would be removed and loaded immediately for subsequent disposal at an acceptable off-site location. Contaminated

grading and mowing materials are not anticipated; however, if any such materials are encountered during excavation, they would be disposed of at the nearest appropriate facility in accordance with applicable laws, ordinances, regulations, and standards. It is estimated that not more than 20 cubic yards of construction debris and material waste would be generated each week (during heavier periods of construction), which would be accumulated in a construction debris container and hauled off monthly. A list of acceptable waste facilities is listed in Table 3.11-1.

Table 3.11-1. Waste Facilities near the Muscle Shoals Solar Project Site

Landfill	Address	Website	Description
Cherokee Industrial Landfill	1828 Cane Creek Road Cherokee, AL 35616	N/A	Non-hazardous Industrial Waste, Construction and Demolition Debris, Asbestos, and Tires
Colbert Household Garbage Collection Center	201 N Main Street Tuscumbia, AL 35674	http://www.colbertcounty.org/trash.html	Household waste, building type debris, trees and limbs, paper, tires, mattresses, televisions, appliances
Shoals Solid Waste Industrial Landfill	2015 Missouri Street Highway 43 South Tuscumbia, AL 35674	http://www.colbertcounty.org/trash.html	Construction and Demolition Debris Landfill Gas Collection System Recycling Facility

Hazardous Materials Management

During construction, hazardous materials would be stored on-site in storage tanks, vessels, or other appropriate containers specifically designed for the characteristics of the materials to be stored. The storage facilities would include secondary containment in case of tank or vessel failure. Construction- and decommissioning-related hazardous materials used for development of the Proposed Project would include: gasoline, diesel fuel, oil, lubricants, and small quantities of solvents and paints. Material Safety Data Sheets for applicable materials present on-site would be made readily available to on-site personnel.

Fueling of some construction vehicles would occur in the construction area. Other mobile equipment would return to the laydown area for refueling. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. Fuel for construction equipment could be provided by a fuel truck or could be stored in aboveground double-walled storage tanks with built-in containment. The volume of each individual tank would not exceed 1,320 gallons, the threshold above which a Spill Prevention, Countermeasure and Control (SPCC) Plan would be required (40 CFR 112). However, because there will be fuel in reserve for diesel generators, in addition to the volume of oil contained in the main electrical transformers, the total volume of regulated materials may exceed the threshold. In that case, an SPCC Plan would be prepared.

The SPCC Plan would include procedures, methods, and equipment supplied during construction to prevent discharges from reaching navigable waters. The plan would be certified by a Registered Professional Engineer and a complete copy maintained on-site. The administering agency is the EPA; however, ADEM is the local Certified Unified Program Agency that is responsible for inspections and approvals related to the SPCC program.

No chemicals or hazardous materials would be stored on-site during operations. They would be transported in for immediate use during maintenance visits. The transport, storage, handling, use and disposal of chemicals would be conducted in accordance with applicable laws, ordinances, regulations, and standards.

At the end of its useful life, the Project facilities would be decommissioned and dismantled, restoring the Project Site. During decommissioning, above ground equipment and below ground electrical connections would be removed from the Project Site. In addition, concrete pads and foundations would be broken and removed, underground utilities would be abandoned, compacted areas would be scarified, and soils would be stabilized. The majority of decommissioned materials and equipment would be recycled. Muscle Shoals Solar recycling attains high recycling rates with their state-of-the-art recycling facilities, achieving up to 90 percent reuse of semiconductor materials and 90 percent reuse of glass. Materials that cannot be recycled would be disposed at approved facilities.

Alternatively, the Project facilities may be repurposed for new solar technologies available at the end of the plant lifecycle, where equipment, cabling, and foundations would be re-used where possible.

Chemicals that could be present during construction and decommissioning of the Proposed Action are included in Table 3.11-2.

Table 3.11-2. Summary of Special Handling Precautions for Large Quantity Hazardous Materials

Hazardous Material	Use	Relative Toxicity[1] and Hazard Class[2]	Permissible Exposure Limit	Storage Description; Capacity	Storage Practices and Special Handling Precautions
Diesel Fuel	Equipment Generator refueling and emergency diesel fire pump	Low toxicity; Hazard class – Combustible liquid	PEL: none established TLV: 100 mg/m^3	Carbon steel tank (3,600 gallons)	Secondary containment, overfill protection, vapor recovery, spill kit.
Hydraulic fluid (if applicable)	Tracker drive units	Low to moderate toxicity; Hazard class – Class IIIB combustible liquid	TWA (oil mist): 5 mg/m^3 STEL: 10 mg/m^3	Hydraulic drive tank, approximately 20 gallons per tracker drive unit (if applicable) throughout solar field. Carbon steel tank, maintenance inventory in 55-gallon steel drums.	Found only in equipment with a small maintenance inventory. Maintenance inventory stored within secondary containment; alternative measures to secondary containment for equipment would be implemented at the project.

Table 3.11-2. Summary of Special Handling Precautions for Large Quantity Hazardous Materials

Hazardous Material	Use	Relative Toxicity[1] and Hazard Class[2]	Permissible Exposure Limit	Storage Description; Capacity	Storage Practices and Special Handling Precautions
Lube Oil	Lubricate rotating equipment (*e.g.,* tracker drive units)	Low toxicity Hazard class – NA	None established	Carbon steel tank, maintenance inventory in 55-gallon steel drums.	Secondary containment for tank and for maintenance inventory.

PEL – permissible exposure limit
TLV – threshold limit value
TWA – time weighted average
STEL – short-term exposure limit

[1] Low toxicity is used to describe materials with an NFPA Health rating of 0 or 1. Moderate toxicity is used describe materials with an NFPA rating of 2. High toxicity is used to describe materials with an NFPA rating of 3. Extreme toxicity is used to describe materials with an NFPA rating of 4.
[2] NA denotes materials that do not meet the criteria for any hazard class defined in the 1997 Uniform Fire Code.

Water needs for the Proposed Action would be met using groundwater or water trucks; the Project would not need potable water or a water treatment system. The Project Site would not have permanent on-site sanitary facilities. During construction, portable chemical toilets would be used, and groundwater or trucked-in water would be used for dust suppression. During operation, modules would be cleaned using trucked-in purified water, free of detergents and additives. Module cleaning would occur two or fewer times a year. During decommissioning, portable chemical toilets would be used by workers, and either groundwater or trucked-in water would be used for dust suppression.

Muscle Shoals Solar would develop and implement a variety of plans and programs to ensure safe handling, storage, and use of hazardous materials (e.g., Hazardous Material Business Plan). Facility personnel would be supplied with appropriate personal protective equipment (PPE), would be properly trained in the use of PPE as well as the handling, use, and cleanup of hazardous materials used at the facility, and would be properly trained on the procedures to be followed in the event of a leak or spill. Adequate supplies of appropriate cleanup materials would be stored on-site.

Hazardous Waste

Small quantities of hazardous wastes would be generated during construction, operation and maintenance, and decommissioning. Hazardous wastes generated during the construction phase would include substances such as paint and primer, thinners, and solvents. Hazardous solid and liquid waste streams that would be generated during operation of the Project include substances such as used hydraulic fluids, used oils, greases, filters, etc., as well as fluorescent light bulbs, spent cleaning solutions, and spent batteries. Hazardous wastes generated during decommissioning would include substances such as carbon dioxide, diesel fuel, hydraulic fuel, and lube oil. To the extent possible, hazardous wastes would be recycled. Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects.

Muscle Shoals Solar (or its contractor) would obtain a hazardous waste generator identification number from the State of Alabama prior to generating any hazardous waste; spills would be reported to the ADEM. A sampling and cleanup report would be prepared and sent to the agency to document each spill and clean up. Each spill, regardless of amount, would be cleaned up within 48 hours and a spill report completed. Copies of spill and cleanup reports would be kept on-site.

Minimal amounts of petroleum fuel would be kept on-site during construction. BMPs would be implemented in order to minimize the potential of a spill and to instruct on-site workers on how to contain and clean up any potential spills. The Project Site would be surrounded by security fencing during both construction and operational phases and access gates would normally remain locked. General public health and safety would not be at risk in the event of an accidental spill on-site.

Solid (Non-Hazardous) Waste

Construction, operation and maintenance, and decommissioning would generate non-hazardous solid wastes. Facility-related wastes generated during all phases of the Proposed Action would include soiled rags, worn or broken metal and machine parts, defective or broken electrical materials, other scrap metal and plastic, insulation material, empty containers, paper, glass, and other miscellaneous solid wastes including the typical refuse generated by workers. These materials would be disposed of by means of contracted refuse collection and recycling services. Waste collection and disposal would be in accordance with applicable regulatory requirements to minimize health and safety effects.

Information on universal wastes anticipated to be generated during Project construction and decommissioning activities is provided in Table 3.11-3. Universal wastes and unusable materials would be handled, stored, and managed per General Universal Waste requirements.

Table 3.11-3. Summary of Construction Waste Streams and Management Methods

Waste Stream and Classification	Origin and Composition	Estimated Amount	Estimated Frequency of Generation	On-site Treatment	Waste Management Method/Off-site Treatment
Construction waste - Hazardous	Empty hazardous material containers	1 cubic yard per week (cy/wk)	Intermittent	None. Accumulate on-site for <90 days	Return to vendor or dispose at permitted hazardous waste disposal facility
Construction waste – Hazardous	Solvents, used oil, paint, oily rags	175 gallons	Every 90 days	None. Accumulate on-site for <90 days	Recycle or use for energy recovery
Spent batteries - Universal Waste	Lead acid, alkaline type	20 in 2 years	Intermittent	None. Accumulate on-site for <90 days	Recycle

Table 3.11-3. Summary of Construction Waste Streams and Management Methods

Waste Stream and Classification	Origin and Composition	Estimated Amount	Estimated Frequency of Generation	On-site Treatment	Waste Management Method/Off-site Treatment
Construction waste – Non-hazardous	Scrap wood, concrete, steel, glass, plastic, cardboard, paper	5 cy/week	Intermittent	None	Recycle wherever possible, otherwise dispose to Class III landfill
Sanitary waste – Non-hazardous	Portable chemical toilets - sanitary waste	200 gallons/ day	Periodically pumped to tanker truck by licensed contractors	None	Ship to sanitary wastewater treatment plant
Office waste – Non-hazardous	Paper, aluminum, food	1 cy/week	Intermittent	None	Recycle or dispose to Class III landfill

The operation of the solar facility is expected to generate non-hazardous wastes and small quantities of hazardous wastes. Operation of the transmission line would generate minimal quantities of waste. The types of waste and their estimated volumes are summarized in Table 3.11-4.

Table 3.11-4. Summary of Operation Waste Streams and Management Methods

Waste Stream and Classification	Origin and Composition	Estimated Amount	Estimated Frequency of Generation	Waste Management Method	
				On-site	Off-site
Used Hydraulic Fluid, Oils and Grease – Non-RCRA Hazardous	Tracker drives, hydraulic equipment	1000 gallons/year	Intermittent	Accumulated for <90 days	Recycle
Oily rags, oil absorbent, and oil filters – Non RCRA Hazardous	Various	One 55-gallon drum per month	Intermittent	Accumulated for <90 days	Sent off-site for recovery or disposed at Class I landfill
Spent batteries – Universal Waste	Rechargeable and household	<10/month	Continuous	Accumulate for <1 year	Recycle
Spent batteries – Hazardous	Lead acid	20 every 2 years	Intermittent	Accumulated for <90 days	Recycle
Spent fluorescent bulbs – Universal Waste	Facility lighting	< 50 per year	Intermittent	Accumulate for <1 year	Recycle

Wastewater

During construction, portable chemical toilets would be provided for workers in the solar fields. No adverse effects are anticipated from wastewater treatment and disposal. No portable chemical toilets will be on-site during operations and maintenance. Portable chemical toilets would also be provided during decommissioning of the Project.

Under the Proposed Action, hazardous materials would be utilized, and hazardous waste would be generated during construction, operation, and decommissioning activities. However, with the use of industry standards, best management practices, and use of the Spill Prevention plan, direct impacts would be temporary and minor. No indirect impacts are anticipated.

3.12 PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

This section describes an overview of existing public health and safety, and the potential impacts associated with the Proposed Action and No Action Alternatives. Public health issues include emergency response and preparedness to ensure Project construction and operation do not pose a threat to public health and safety. Safety issues include occupational (worker) safety in compliance with the Occupational Safety and Health Administration (OSHA) standards.

3.12.1 Affected Environment – Public and Occupational Health and Safety

The Project Site is currently private property. Land uses on the Project Site are primarily agricultural or unused with a small amount of residential use, though no persons currently live within the proposed Site footprint. Since the land occupied by the Project Area is not used by, or accessible to, the general public, there are no current public health and safety issues.

Public emergency services in the area include a regional hospital, law enforcement services, and fire protection services. Tishomingo Health Services in Iuka (Mississippi), Eliza Coffee Memorial Hospital in Florence, Shoals Hospital in Tuscumbia, and the Helen Keller Hospital in Tuscumbia are in the area. Law enforcement services in Cherokee, Alabama are provided by the Cherokee Police Department, located at 3752 Old Lee Highway in Cherokee (Colbert County Sherriff 2019a). In addition, Colbert County law enforcement services are provided by the Colbert County Sheriff's Department, located at 201 North Main Street in Tuscumbia (Colbert County Sherriff 2019b). Fire protection services are provided by the Barton Volunteer Fire Department (less than a mile and 2 minutes away), the Cherokee Fire Department Station 3 (about 4 miles and 6 minutes away), and the Tuscumbia City Fire Department (about 15 miles and 15 minutes away) (Google Map 2019a, Google Map 2019b, Google Map 2019c). While the nearest fire station to the Project Site is a volunteer station, Cherokee Station 3 is about 6 minutes away; just off Old Lee Highway (Google Map 2019b). The Alabama Emergency Management Agency (AEMA) has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials in association with Project activities (AEMA 2014).

3.12.2 Environmental Consequences – Public and Occupational Health and Safety

This section describes the potential impacts to public and occupational health and safety should the No Action or Proposed Action Alternatives be implemented.

3.12.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility and transmission line upgrades would not be constructed; therefore, no Project related impacts on public health and safety would result. Existing land use would be expected to remain a mix of farmland and unused land, and existing public health and safety issues would be expected to remain as they are at present.

3.12.2.2 Proposed Action

Workers in the Project Area would have an increased safety risk associated with the construction activities. However, because construction work has known hazards, standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. Such health and safety plans emphasize BMPs for Project Site safety management to minimize potential risks to workers. Examples of best practices include employee safety orientations; establishment of work procedures and programs for site activities; use of equipment guards; emergency shut-down procedures; lockout procedures; site housekeeping; personal protective equipment; regular safety inspections; and plans and procedures to identify and resolve hazards.

Potential public health and safety hazards could result in association with the flow of construction traffic along the public roadways. Construction traffic will access the Project Site using Old Lee Highway to Mulberry Lane on the East and to Moody Lane on the West. Residential properties are located south of Old Lee Highway and west of Moody Lane. In addition, Essity and Navistar have manufacturing facilities east of Mulberry Lane, and the Vulcan Quarry is southwest of the Project Site on Moody Lane at Old Lee Highway. Health and safety plans established and adhered to by the construction team would include traffic procedures to minimize potential safety concerns.

Emergency response for the Project Area would be provided by the local, regional, and state law enforcement, fire, and emergency responders described in Section 3.11.1.

No public health or safety hazards would be anticipated as a result of operations. Overall, impacts to public health and safety in association with implementation of the Proposed Action would be considered temporary and minor.

3.13 TRANSPORTATION

This section describes an overview of existing transportation resources and the potential impacts on these transportation resources that would be associated with the Proposed Action

and No Action Alternative. Components of transportation resources that are analyzed include roads, traffic, railroads, and airports.

3.13.1 Affected Environment – Transportation

3.13.1.1 Roads

The Project Site is located in rural Colbert County, 15 miles west of the City of Florence, at the intersection of Old Lee Highway and Mulberry Lane. These roads are the southern and eastern boundaries of the Project Site, respectively. Old Lee Highway is a main artery in this rural county with several large industrial businesses in the immediate area. A neighboring manufacturing business, SCA Tissue North America, uses Mulberry Lane as one of its entrances from Old Lee Highway. The Barton Riverfront Industrial Park, containing SCA along with Freightcar America's 2.2 million square foot facility, is located east of the Project Site. On the western boundary of the Project Site, Moody Lane is used as a connector between Old Lee Highway and State Route 10 with Vulcan Materials located at the intersection of Moody and Old Lee Highway and with Cherokee-Nitrogen located north of the Project Site against the Tennessee River. The majority of the smaller county roads around the Project Site are utilized by manufacturing workers, agricultural workers, homeowners, and/or their visitors. Many of these rural roads terminate in residential areas, though some connect to other county roads. No public roads are present within the Project Area boundaries; instead, gravel and dirt roads provide vehicular access to the agricultural fields and farm buildings.

An active rail line runs along the southern border of the Project Site. Old Lee Highway is a two lane paved road that runs east-west along the southern boundary of the Project Site, paralleling the rail line. Old Lee Highway rejoins U.S. Highway 72, a divided four-lane highway, about 5 miles east and 5 miles west of the Project Site. East of the Project Site, Mulberry Lane, or County Road 27, is a two-lane road that becomes less traveled north of Titus Lane, eventually curving to the west to provide the northern boundary of the property. Moody Lane, or County Road 25, to the west is a two-lane road. (Figure 3.13-1).

The nearest major highway is U.S. Highway 72, approximately 0.5 mile south of the Project Site. Much of U.S. 72, the principal east-west arterial in the county, has been upgraded with interchanges at major state highways. Natchez Trace Parkway, about 3 miles northwest of the Project Site, is a minor arterial stretching from Natchez, Mississippi through Alabama nearly to Nashville, Tennessee. State Highway 247, about 7 miles east, is considered a major collector in the middle of Colbert County. With the exception of these county roads and County Road 10, branching off of Moody Lane about a mile north of Old Lee Highway (County Road 20), roads in the immediate vicinity of the Project Site are considered local by the Alabama Department of Transportation (ALDOT) (ALDOT 2014a, ALDOT 2017a).

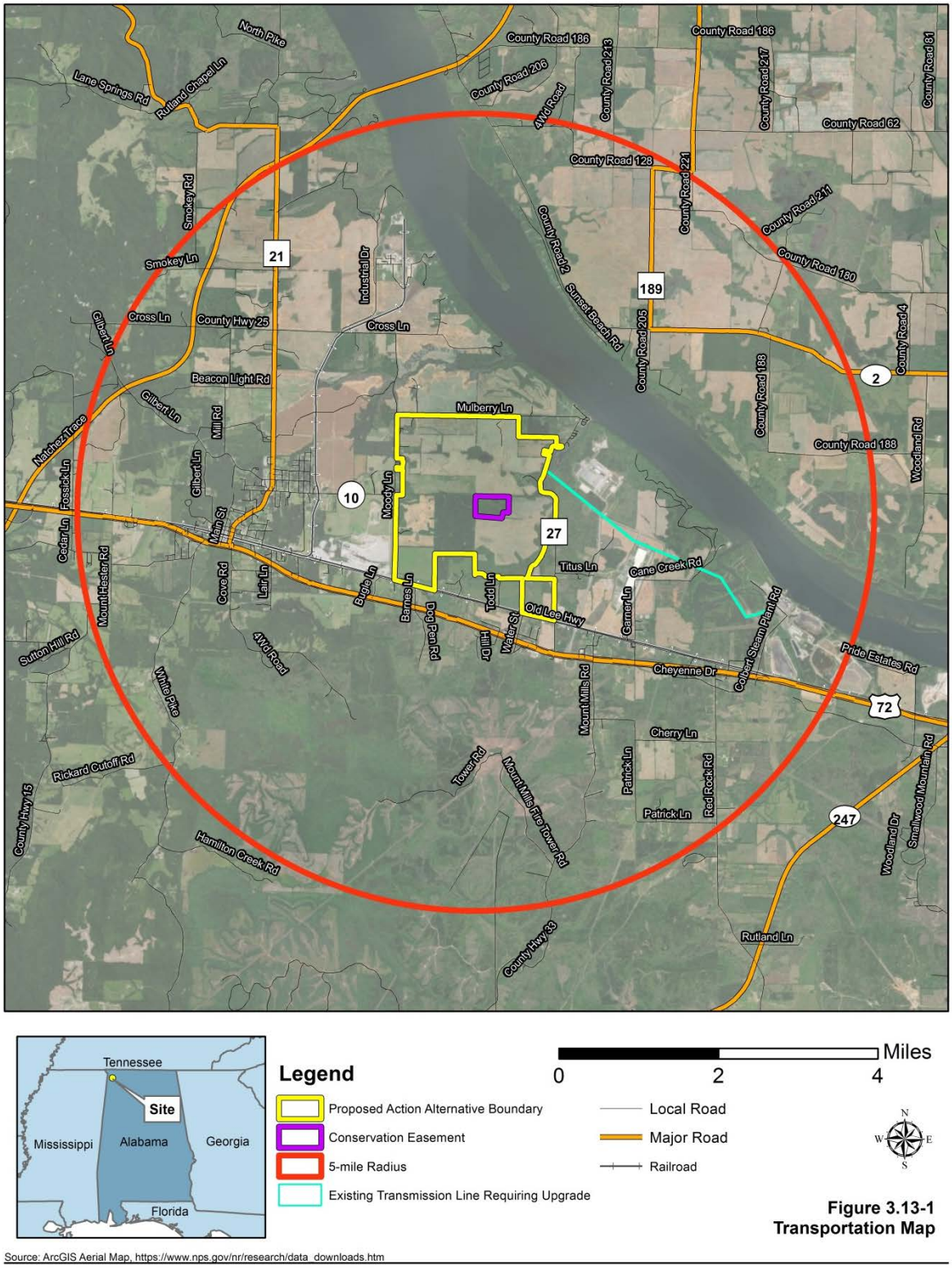


Figure 3.13-1. Transportation Map

3.13.1.2 Traffic

Existing traffic volumes were determined using Average Annual Daily Traffic (AADT) counts measured at exiting ALDOT stations. The 2017 AADT for U.S. Highway 72 was 10,280 just south of the Project Site at Station 628. The 2017 AADT for roads in the immediate vicinity of the Project Site are tabulated in Table 3.13-1 below. Traffic data was not available for any other roads in the immediate vicinity of the Project Site (ALDOT 2017b). The county roads around the Project Site support levels of traffic typical for rural Alabama.

Table 3.13-1. 2017 Average Annual Daily Traffic near Proposed Project Site

Location	Descriptor	Station	AADT Count
Old Lee Highway	South of Site	979	490
Mulberry Lane (CR 27)	East of Site; north of Titus Lane	658	230
Mulberry Lane	North of Site	657	100
Moody Lane	West of Site; south of CR10	655	1000
Moody Lane	West of Site; north of CR10	656	630
County Road 10	West of Site	654	480

CR = County Road
Source: ALDOT 2017b

The Project Site is located about 3 miles east of the Town of Cherokee in rural Colbert County with several large industries in the immediate area. Immediately south of the Project Site, Old Lee Highway is a major collector with almost 500 AADT. About a quarter of the way up the eastern edge of the property, Titus Lane comes off of Mulberry Lane, providing a side entrance to SCA Tissue North America, a major employer. Barton Riverfront Industrial Park, containing SCA and Freightcar America, is located east of the Project Site. The AADT for Mulberry is measured after this juncture with Titus Lane; an AADT for Titus Lane was not available. On the western boundary of the Project Site, Moody Lane is used as a connector between Old Lee Highway and State Route 10 with Vulcan Materials located at the intersection of Moody and Old Lee Highway and with Cherokee-Nitrogen located north of the Project Site against the Tennessee River. Moody Lane is considered a major collector by ALDOT (ALDOT 2017b).

3.13.1.3 Rail and Air Traffic

Norfolk Southern operates a line immediately south of the Project Site that is roughly parallel to Old Lee Highway, with a railroad crossing on Main Street in Cherokee and a spur to Cherokee Nitrogen about 2 miles west of the Project Site. The line travels from Memphis, TN to Sheffield, AL to Chattanooga, TN, with a major rail classification yard in Sheffield. Norfolk Southern's intermodal site at the Huntsville International Intermodal Center, operated by the Huntsville-Madison County Airport Authority, serves as an inland port for international cargo. In addition, the Tennessee Southern Railroad Company operates a line running from Columbia, Tennessee

to Florence, with an intermodal port facility in Florence that integrates rail, barge, and truck transportation services (ALDOT 2014b, ALDOT 2014c, ALDOT 2014d).

The closest major airport is the Huntsville International Airport, in Huntsville, Alabama, approximately 65 miles east of the Project Site. The closest regional airport is the Northwest Alabama Regional Airport in Muscle Shoals, approximately sixteen miles east of the Project Site. In 2018, approximately 5,600 passengers traveled through the Northwest Alabama Regional Airport on 1,186 flights. The majority of these passengers traveled to Atlanta, Georgia, presumably for connecting flights (DOT 2019).

3.13.2 Environmental Consequences – Transportation

This section describes the potential impacts to transportation resources should the Proposed Action or No Action Alternatives be implemented.

3.13.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar project would not be constructed. Therefore, no Project related impacts to transportation resources would result. Existing land use would be expected to remain a mix of farmland and unused land, and the existing transportation network and traffic conditions would be expected to remain as they are at present.

3.13.2.2 Proposed Action

Construction of the Proposed Action would impact roads in the immediate vicinity, which are currently used by industrial workers, agricultural workers, residents, and visitors. Construction traffic would impact roads used by large industrial businesses including SCA and Freightcar America to the east, Vulcan Materials to the west, and Cherokee-Nitrogen to the north. During construction of the proposed solar project, an average crew of between 200 and 300 workers would be present at the Project Site from approximately 7 am to 7 pm, Monday through Friday, for approximately 12 months. A majority of these workers would likely commute from the local or regional area. Other workers would come from outside the region and many would likely stay in local hotels in Florence or Muscle Shoals. Workers would either drive their own vehicles or carpool to the Project Site. Parking would be on-site during the day. Work teams would be released during lunch break and some would likely visit local restaurants and businesses at this time. Additional traffic due to deliveries and waste removal would consist of a maximum of approximately 100 vehicles per day during heavier months of construction and generally averaging 30 to 50 vehicles per day over the entire construction period.

Traffic flow around the work site would, therefore, be heaviest at the beginning of the work day, at lunch, and at the end of the work day. As seen on Figure 2-2, workers and deliveries could access the Project Site from the east off Mulberry Lane, or from the west off Moody Lane. Site entrances are shown on Figure 2-2.

Construction traffic will impact roads in the immediate vicinity of the Project Site, including Old Lee Highway, Mulberry Lane, and Moody Lane. Construction traffic will impact traffic on Mulberry Lane where Titus Lane provides a side entrance to SCA and Freightcar America. Construction traffic will also impact Moody Lane with Cherokee-Nitrogen to the north. These avenues for the surrounding businesses have the potential to be impacted by construction traffic. Should traffic flow be a problem, Muscle Shoals Solar would consider staggered work shifts to space out the flow of traffic to and from the Project Site. Muscle Shoals Solar would also consider posting a flag person during heavy commute periods to manage traffic flow and to prioritize access for local residents. Use of such mitigation measures would minimize potential adverse impacts to traffic and transportation to less than significant levels (ALDOT 2017b).

Construction equipment and material delivery would require approximately 15 semi-tractor trailer trucks or other large vehicles visiting the Project Site per day during a 6-month portion of the construction activities. The total number of deliveries to the Project Site is estimated at approximately 2,500 over the entire 12-month construction period. These vehicles should be easily accommodated by existing roadways; therefore, only minor impacts to transportation resources in the local area would be anticipated as a result of construction vehicle activity.

Several on-site maintenance access roads would be maintained on the Project Site. Muscle Shoals Solar would construct four 20 to 25-ft permanent gravel access roads on the Project Site connecting Site entrances to Moody Lane and Mulberry Lane (Figure 2-2). Muscle Shoals Solar would also construct a non-permanent construction Site entrance on Moody Lane and one on Mulberry Lane. A permanent conservation access easement will be maintained off of Mulberry Lane. A dirt perimeter road would be constructed and maintained inside the Project Site fence to allow periodic access for Site inspection and maintenance. The Project Site will be fenced and remain closed to through traffic.

Due to the Project Site's proximity to the town of Cherokee, possible minor traffic impacts along Old Lee Highway and along U.S. Highway 72 could occur. Workers could potentially commute from Florence and Muscle Shoals. However, because the proposed workforce would consist of a peak of 300 employees for only part of the 12-month construction period, the addition of these vehicles to the existing traffic would be considered insignificant.

During operation of the solar facility, one or two employees would visit the Project Site as needed for scheduled/preventative maintenance and for unscheduled maintenances or outages. Periodic washing of the solar panels would increase this number by 12 employees and water trucks would be present on-site temporarily for approximately 30 days no more than twice a year. This increased traffic should not have a significant impact on the local roadways.

The construction and operation of the proposed solar project would have little to no effect on rail traffic or the operation of the airports in the region. During construction, rail may be utilized to transport some materials and air may be utilized to transport some workers. The operation of the solar facility would not affect commercial air passenger or freight traffic in the region and would not adversely affect any crop dusters operating in the vicinity of the Project Site. Impacts to rail or air traffic are anticipated to be minor and insignificant.

Overall, with the implementation of mitigation measures if necessary, direct impacts to transportation resources associated with the Proposed Action would be minor. The Proposed Action would not result in any indirect impacts to transportation.

3.14 SOCIOECONOMICS

This section describes an overview of existing socioeconomic conditions within the Project area and the potential impacts that would be associated with the Proposed Action and No Action Alternative. Components of socioeconomic resources that are analyzed include population, employment, and income.

3.14.1 Affected Environment – Socioeconomics

The proposed Project Area is in the northern part of Colbert County, Alabama, approximately 3 miles east of the Town of Cherokee, and approximately 15 miles west of the City of Florence. Colbert County is the impact area for socioeconomic resources.

3.14.1.1 Population

Population trends and projections are presented in Table 3.14-1. In 2017, Colbert County's population was 54,435. Block Group 2, Census Tract 112, which contains the proposed solar Project Area, as well as the surrounding area, had a population of 898. Between 2000 and 2017, population decreased in Colbert County and the Block Group by 1 percent and 10.9 percent, respectively. Conversely, population of the United States and the state of Alabama grew 14.1 percent and 9.1 percent, respectively, during the same period (USCB 2017). By 2030, the County's population is projected to continue its slight downward trend, decreasing to 53,707. Population is projected to increase 5.6 percent in Alabama and 10.7 percent in the US between 2017 and 2030, continuing its growth trend at a slower rate (CBER 2018; USCB 2018a; USCB 2010).

Table 3.14-1. 2000 – 2030 Population Data

Area	2000	2010	2017	Projection 2030	Percent Increase 2000 - 2017	Percent Increase 2017 - 2030
Colbert County	54,984	54,428	54,435	53,707	-1.0%	-1.3%
Block Group 2, Census Tract 210	1,008	866	898	NA	-10.9%	NA
Alabama	4,447,100	4,779,736	4,850,771	5,124,380	9.1%	5.6%
United States	281,421,906	308,745,538	321,004,407	355,501,000	14.1%	10.7%

Source: USCB 2017; USCB 2018a; CBER 2018; USCB 2010; USCB 2019

3.14.2 Employment and Income

Employment and industry trends are presented in Table 3.14-2. Colbert County has a total employment of about 31,664 jobs. Approximately 2.3 percent are employed in farming, above both the national level of 1.3 percent and the state level of 1.8 percent. Manufacturing provides 21.1 percent of the jobs, more than the national share of 6.8 percent and the state share of 10.4 percent. Retail trade is slightly higher in the County (10.8 percent) than the state (10.7 percent) and national shares (9.8 percent). Government employment is similar to the state share and greater than the national share (BEA 2018a; BEA 2018b).

The 2017 unemployment rate for Colbert County was 5.2 percent, higher than the state and national rate of 4.4 percent (BLS 2019a; BLS 2019b).

Table 3.14-2. 2017 Employment Data

Area	Total Employment	Percent Farm	Percent Manufacturing	Percent Retail Trade	Percent Government
Colbert County	31,664	2.3%	21.1%	10.8%	15.5%
Alabama	2,652,406	1.8%	10.4%	10.7%	15.2%
United States	196,132,200	1.3%	6.8%	9.8%	12.4%

Source: BLS 2019a; BLS 2019b

Table 3.14-3 presents per capita personal income for the County, State and Nation. Per capita personal income in Colbert County in 2017 was $37,602, 72.8 percent of the national average of $51,640 and less than the state average of $40,805 (BEA 2019).

Table 3.14-3. 2017 Per Capita Personal Income Data

Area	Per Capita Personal Income	Percent of US
Colbert County	37,602	72.8%
Alabama	40,805	79.0%
United States	51,640	100.0%

Source: BEA 2019

3.14.3 Environmental Consequences – Socioeconomics

This section describes the potential impacts to socioeconomic resources should the Proposed Action or No Action Alternatives be implemented. Social and economic issues considered for evaluation within the impact area include change to current and projected population levels, change in expenditures for goods and services, and short-term or long-term impacts on employment and income.

3.14.3.1 No Action Alternative

Under the No Action Alternative, the proposed solar project would not be constructed; therefore, no Project related changes to population and job growth would occur. Under the No Action Alternative, current employment trends in the area would likely continue with most of the employment in the existing economic sectors of manufacturing and government. Therefore, no beneficial socioeconomic impacts from a change in population, employment, or expenditures would occur under the No Action Alternative.

3.14.3.2 Proposed Action

Implementation of the Proposed Action would entail a variety of operation and maintenance related activities and would directly affect employment, industry, and commerce. The direct impact to the economy associated with construction activities is expected to be short-term and beneficial to the local economy. The implementation of the proposed Project would directly cause the creation of between 200 and 300 full time equivalent construction jobs for approximately 12 months. Benefits associated with the Project include the purchase of materials, equipment, and services and a temporary increase in employment and income. This increase would be local or regional, depending on where the goods, services, and workers were obtained. It is likely some construction materials and services would be purchased locally in the Colbert County area, as well as in adjacent counties and cities. The majority of the construction workforce would likely be from local or regional sources, mostly from construction contractors, with a small portion of the workforce coming from out-of-state.

Indirect employment and income impacts would result from expenditure of the wages earned by the workforce involved in construction activities, as well as the local workforce used to provide materials and services. Materials, equipment, and services may be purchased locally in the Colbert County area, as well as in adjacent counties and the larger Florence-Muscle Shoals metropolitan area. Revenue generated by income tax and sales tax from new workers associated with the construction activities would benefit the local economy. However, given the relatively small magnitude of the anticipated workforce, this impact is considered to be negligible relative to the size of the local economy.

Operation of the Project would have a small positive impact on employment in Colbert County. One or two employees would visit the Project Site as needed for scheduled/preventative maintenance and for unscheduled maintenances or outages. A temporary workforce of 12 employees would be on-site twice a year for approximately 30 days for solar panel cleaning activities. Grounds maintenance and other specific contracts for Project operation would most likely be local and ongoing on a regular basis.

Overall, socioeconomic impacts for the operation of the Project are anticipated to be positive and long-term, although small relative to the total economy of the region. The local tax base would increase from construction of the solar facility and would be most beneficial to the Colbert County area. Additionally, the local government would not have to provide any of the traditional

government services typically associated with a large capital investment, such as water and sewer.

3.15 ENVIRONMENTAL JUSTICE

This section describes an overview of environmental justice considerations within the Project area and the potential environmental justice impacts that would be associated with the Proposed Action and No Action Alternatives. Components of environmental justice that are analyzed include minority and low-income population.

3.15.1 Affected Environment – Environmental Justice

EO 12898 directs federal agencies to identify and address, as appropriate, potential disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. While TVA is not subject to this EO, TVA typically assesses environmental justice impacts in its NEPA reviews. The CEQ has provided guidance for addressing environmental justice in *Environmental Justice: Guidance under the National Environmental Policy Act* (CEQ 1997).

In identifying minority and low-income populations, the following CEQ definitions of minority individuals and populations and low-income populations were used:

- *Minority individuals.* Individuals who identify themselves as members of the following population groups: American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Black, Hispanic, or two or more races.
- *Minority populations.* Minority populations are identified where (1) the minority population of an affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. For the purposes of this analysis, "meaningfully greater" is defined as greater than 20 percent of the minority population percentage in the general population of the larger geographical region within which the affected area is located.
- *Low-income populations.* Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the US Census Bureau's (USCB) Current Population Reports, Series P-60, on Income and Poverty. In this analysis, low-income populations are identified where (1) the population of an affected area exceeds 50 percent low-income based on the Census data or (2) the percentage of low-income population in the affected area is greater than 20 percent of the low-income population percentage in the larger geographical region within which the affected area is located.

According to CEQ guidance, U.S. Census data are typically used to determine minority and low-income population percentages in the affected area of a project in order to conduct a quantitative assessment of potential environmental justice impacts. The geographic unit used in the analysis to identify any environmental justice communities of concern is the census block group. For the purposes of this analysis, a census block group constitutes an environmental

justice community if one of the two criteria described above for either minority or low-income populations are met.

The Project Are that would be affected by the Proposed Action is located in the northern part of Colbert County, Alabama, near the City of Florence. Therefore, Colbert County is the geographical impact area for environmental justice.

3.15.1.1 Minority Population

The analysis for minority populations in the ROI followed the CEQ guidance for identifying minority populations. Information was derived from the 2013-2017 American Community Survey 5-Year Estimates.

Table 3.15-1 presents the results of the minority population analysis for the area of interest. In 2017, minorities constituted 21.2 percent of the total population in Colbert County. Block Group 2 Census Tract 210, which contains the Project Area, has a greater share of minority population (34.3 percent) than the state share (34.1 percent). However, these levels are less than the national average of 38.5 percent. Based on this analysis, residents of the block group in the area of the proposed Project Site are not considered an environmental justice community because the minority population does not exceed 50 percent of the total block population nor 20 percent greater than the comparable county minority population.

Table 3.15-1. 2017 Minority Population Data

Area	Total Population	Minority Population	Percent Minority Population
Block Group 2, Census Tract 210	898	308	34.3
Colbert County	54,435	11,558	21.2
Alabama	4,850,771	1,652,692	34.1
United States	321,004,407	123,726,618	38.5

Source: USCB 2018b

3.15.1.2 Low-income Populations

The analysis for low-income populations in the ROI followed the CEQ guidance for identifying low-income populations. Information was derived from the 2013-2017 American Community Survey 5-Year Estimates.

Table 3.15-2 present the results of the low-income population for the area of interest. In 2017, the portion of the population in Colbert County that had income below the poverty level was 16.8. Block Group 2 contained 9.7 percent of the population living below the poverty level in 2017. These levels are below the state average of 18 percent (USCB 2018c). Based on this analysis, residents of the block group in the area of the proposed Project Site are not considered an environmental justice community because the low-income population does not

exceed 50 percent of the total block population nor 20 percent greater than the comparable county low-income population.

Table 3.15-2. 2017 Poverty Level Data

Area	Total Population	Persons Below Poverty Level	Percent of Persons Below Poverty Level
Block Group 2, Census Tract 210	898	87	9.7
Colbert County	53,948	9,056	16.8
Alabama	4,729,116	849,699	18.0
United States	313,048,563	45,650,345	14.6

Source: USCB 2018c

3.15.2 Environmental Consequences – Environmental Justice

This section describes the potential environmental justice impacts should the Proposed Action or No Action Alternatives be implemented. According to the CEQ, adverse health effects to be evaluated within the context of environmental justice impacts may include bodily impairment, infirmity, illness, or death. Environmental effects may include ecological, cultural, human health, economic, or social impacts. Disproportionately high and adverse human health or environmental effects occur when the risk or rate of exposure to an environmental hazard or an impact or risk of an impact on the natural or physical environment for a minority or low-income population is high and appreciably exceeds the impact level for the general population or for another appropriate comparison group (CEQ 1997).

3.15.2.1 No Action Alternative

Under the No Action Alternative, there would be no changes to the Project area attributable to the proposed action and therefore no disproportionately high and adverse direct or indirect impacts on minority or low-income populations.

3.15.2.2 Proposed Action

No minority or low-income populations have been identified in the potentially affected area. Based on the analysis of impacts for all resource areas presented in this EA, it was determined that there would be no significant adverse health impacts on members of the public or significant adverse environmental impacts on the physical environment (water, air, aquatic, and terrestrial resources) and socioeconomic conditions. As there are no identified environmental justice communities in the block group within which the proposed Project is located, there would be no disproportionately high or any adverse direct or indirect impacts on minority or low-income populations due to human health or environmental effects resulting from the Proposed Action.

CHAPTER 4

4.0 CUMULATIVE IMPACTS

Cumulative impacts are defined as the effects of the Proposed Action when considered together with other past, present, and reasonably foreseeable future actions. Chapter 3, Affected Environment and Environmental Consequences, presents information about past and present environmental conditions, as well as future trends, where appropriate. This chapter addresses the cumulative impacts of the Project and any reasonably foreseeable actions in the vicinity. Muscle Shoals Solar would avoid development or construction within the exclusion areas shown in Figure 2-3, which would result in no cumulative impacts to floodplains and their natural and beneficial functions. Modifications of the existing TVA transmission line and construction of access roads to structures on the line, as well as construction of three new structures to tie Muscle Shoals Solar to the existing TVA transmission line would result in de minimis cumulative impacts to floodplains and their natural and beneficial values as the only activities proposed within the floodplain are the replacement of Structure 27 and the potential construction of an access road.

Minor, or no, impacts to Land Use, Geology, Soils and Prime Farmland, Groundwater, Surface Water, Floodplains, Biological Resources, Visual Resources, Noise, Air Quality, Cultural Resources, Natural Area, Utilities, Waste Management, Health and Safety, Transportation, Socioeconomics, and Environmental Justice are anticipated due to the Proposed Project. Therefore, these resources are not discussed in depth with respect to cumulative impacts. Resources which have to potential to be impacted are discussed under each described project as needed.

Desktop research of potential past, present, and future actions in the Colbert County, Alabama, area was conducted. Resources examined included:

- Local and regional news sources;
- Town of Cherokee, community of Barton, and Colbert County government website records, including planning commission meetings, city meeting minutes, and public notices; and
- Shoals Chamber of Commerce and Economic Development Authority websites and meeting minutes.

On 19 March 2019, AECOM contacted local City and County officials, including the Cherokee, Alabama, Planning and Building departments to gather information on current and foreseeable local projects. No information has been provided regarding foreseeable future local projects from city or county officials. Desktop research failed to identify any foreseeable future local projects that could combine with the Proposed Action to cause cumulative impacts that may significantly affect the environment.

4.1 FEDERAL PROJECTS

TVA decommissioned the Colbert Fossil Plant in 2016 On November 9, 2016, TVA issued a Final Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the deconstruction (TVA 2019c). The plant will not be demolished; rather, the plant is currently being deconstructed. TVA will remove items that can be used elsewhere, and steel removed from the facility will be sold as scrap. Additionally, community leaders are seeking to utilize the plant's coal offloading facility as a port to ship agricultural products and timber out of the Shoals. As of 2017, deconstruction was set to begin in 2020 and could take up to three years to complete (Times Daily 2017). As the construction of the proposed solar facility and the deconstruction of the coal-fired units at TVA's Colbert Fossil Plant would occur simultaneously, cumulative impacts to transportation and waste management could occur. Traffic impacts could include slowdowns and decreases in Level of Service (LOS) in the area as the two projects are less than three miles apart and are both located off Old Lee Highway and Highway 72. Heavy equipment, trucks delivering supplies and hauling debris, and construction worker traffic may cause cumulative traffic delays on these roads. Additionally, large equipment on relatively small rural roads may cause damage to the roads if not carefully managed. However, as TVA is involved with both projects, adjustments to scheduling of deliveries, waste hauling, and construction worker shifts could be used to minimize any potential cumulative impacts to transportation in the area. Once these projects are complete, traffic would return to normal levels, as a large workforce is not anticipated at either project site. Therefore, cumulative impacts to transportation in the immediate vicinity would be minor and temporary.

TVA purchases power from the recently completed River Bend Energy Center in Lauderdale County, Alabama. Operated by NextEra Energy Resources, the facility's 300,000 solar panels have a generating capacity of 75 MW (Alabama Today 2019). The construction of the Proposed Project would contribute to the conversion of farmland to other uses in the northern Alabama area. However, the installation of solar panels is not considered a permanent conversion, as the soil would remain in place under the panels and would be available as farmland once the Project has been decommissioned. Therefore, the construction of the proposed solar facility would not contribute to cumulative impacts to farmland in the northern Alabama area. Additional impacts to visual resources in the general vicinity could also occur due to large tracts of farmland being converted to an industrial appearance. With the use of the proposed setbacks and visual screens, however, this cumulative impact to visual resources would be minimal and not noticeable to the average observer along local roads.

On February 23, 2019, Governor Kay Ivey declared a State of Emergency for several northern Alabama counties, including Colbert County. The emergency was declared in counties which were likely to be or were already being impacted by flooding, tornados, and high winds (Alabama News 2019). In late February the Colbert County Emergency Management Agency advised residents with flood damage to record all damages as this may allow the County to receive Federal recovery assistance (WHNT News 2019). As of March 19, 2019, information was not available regarding the Federal assistance to the Shoals area after the Tennessee River flooded homes and businesses. It is likely that some amount of Federal assistance will be granted to the County and local residents and businesses. In the wake of this natural disaster, it

is possible that major infrastructure, road, bridge, and levee repairs will be initiated. The potential cumulative impacts from disaster repairs and the proposed Project cannot be assessed at this time as local damage assessments are ongoing. It is possible that transportation, visual resources, noise, and socioeconomics could be cumulatively impacted. Federally funded repairs should be relatively rapid, however, and cumulative impacts to these resources would be temporary.

In April 2018, TVA sold a portion of the Colbert Fossil Plant's reserve. A Knoxville-based investment group, organized as a real estate limited partnership known as Muscle Shoals Holdings LLC, paid $5 million ($5,556 per acre) to acquire part of Muscle Shoals Reservation property in northwest Alabama near the Wilson Dam. As this is a private holding, no information was available regarding what developments may occur on this property in the future (Times Free Press 2018). Therefore, an assessment of potential cumulative impacts was not possible.

TVA will be resurfacing the Wilson Dam Bridge, which will close the bridge in 2020 for approximately eight months. TVA has issued a draft EA to refurbish and repair the dam deck and other concrete surfaces and to stop the flow of water through the deck and parapets of the Wilson Dam Bridge in Lauderdale and Colbert Counties, Alabama. Construction of the Wilson Dam began in 1918 and was complete in 1926. TVA owns the Wilson Dam while the USACE Nashville District operates the Wilson Dam locks for TVA. Both the dam and bridge are listed in the National Register of Historic Places as a National Historic Landmark. The original wearing surface of the bridge deck was brick pavers, which were removed in the late 1950s and replaced with the current concrete deck when the additional steel superstructure viaduct was constructed over the lock. The arches appear to be constructed of mass unreinforced concrete. The bridge deck also appears to be unreinforced concrete. Over the years, the downstream face where the concrete arches interface with the parapet have developed widespread spalls (areas where chips, splinters or fragments are broken off) with efflorescence (whitish powdery substance due to migration of mineral rich water through the porous concrete where it evaporates) and visible water movement. In addition, the sidewalk, curb, and deck have developed widespread cracking. TVA has chosen Alternative E as its preferred alternative: remove and replace existing bridge deck; patch deteriorated surfaces of arch faces, rails, and sidewalks (TVA 2019d). This road closure, in conjunction with the ALDOT projects slated for Muscle Shoal (described in Section 4.2 below), may contribute to cumulative negative impacts to transportation in the region. TVA will minimize these impacts by coordinating with ALDOT and Muscle Shoals officials regarding the start date of the Wilson Dan Road resurfacing. Additional mitigation could be achieved by controlling the amount of traffic associated with the Proposed Project.

4.2 STATE AND LOCAL PROJECTS

Multiple ALDOT projects are slated for the Muscle Shoals area in 2019. Two projects on US 43 consist of widening the road to four lanes and the creation of a turning lane. The work is from Alabama 64 north to the Tennessee state line. One of the biggest projects to begin in 2019 will be replacing the two bridges at the Ash Boulevard overpass on Hatch Boulevard in Sheffield. ALDOT officials said the work will not hamper travel, but traffic will only be using one lane in

each direction. Work on the overpass on Mitchell Boulevard at Coffee Road in Florence is scheduled to begin in 2020. According to local officials, it is possible that work could occur simultaneously on both of those projects (Hatch Boulevard and Mitchell Boulevard) at the same time. This is projected to lead to an increase in traffic on Wilson Dam Road, especially if the work on AL133 (partially Wilson Dam Road) is not completed. Work on AL 133 consists of widening the road to four lanes from the Norfolk Southern Railroad overpass to AL 157. Work will also continue on widening and expanding Webster Street into Shoals Research Airpark (Times Daily 2018). Additionally, two resurfacing/repaving projects are underway on AL 133 and AL 20 (ALDOT 2019b and 2019c). The multiple road construction projects in conjunction with construction of the proposed solar facility and the deconstruction of the Colbert Fossil Plant could contribute to cumulative negative transportation impacts. Increased traffic on local roads including heavy equipment and large deliveries may contribute to a decrease in LOS. TVA and Muscle Shoals Solar will monitor and assess traffic conditions over the construction period. If conditions deteriorate to the point of an unacceptable LOS, TVA and Muscle Shoals Solar will modify delivery and shift schedules as needed to minimize negative cumulative impacts. If these ALDOT projects and TVA's refurbishment of the Wilson Dam Bridge occur simultaneously, adverse impacts to transportation would be possible; however, given TVA's involvement with the Proposed Project, the Colbert Fossil Plant deconstruction, and the Wilson Dam refurbishment, TVA could mitigate potential traffic impacts by scheduling of deliveries, and waste hauling, and/or changing the start dates of specific projects or project stages.

A portion of the Barton Riverfront Industrial Park is immediately adjacent to the proposed solar facility. Land adjacent to the Project Site on the eastern side is currently available for sale. Approximately 500 acres are for sale for industrial projects. The industrial park is already home to several large industrial developments including American Rail Car/Navistar and SCA Tissue (Economic Development Partnership of Alabama 2019). A large industrial development on this parcel, currently in wooded condition, could contribute to cumulative impacts to land use, visual resources, socioeconomics, and transportation. As no developments have been proposed for this site, it is not possible to assess potential cumulative impacts at this time. However, as the industrial park already contains several large industrial parcels, cumulative impacts would likely be minor.

Another local development project is a planned expansion and upgrade of the Northwestern Alabama Regional Airport in Muscle Shoals (approximately 14 miles southeast of the Project Site). The Southwest Development project is a plan for the growth of the airport due to the lack of development space adjacent to the existing terminal – also known as the Shoals Research Airpark. The plan involves expanding the existing airport capacity with a new taxi lane and apron and potentially three new hangars for future tenants. Although the preliminary plan only addresses the northwest corner of the airport property, future plans would include offering a large area for business activities (Northwest Alabama Regional Airport 2019). The Shoals Economic Development Authority describes the airport business park site as consisting of 470 acres, with 430 acres of industrially zoned space still available. The site has access to rail, highway, air and water transportation opportunities (Shoals Economic Development Authority 2015). Although this planned airport and research park expansion may impact local transportation and socioeconomics, it is not likely to contribute to cumulative impacts associated

with the proposed Project. It would be constructed in phases, over time, as tenants purchase or lease space.

CHAPTER 5

5.0 LIST OF PREPARERS

Table 5-1 summarizes the expertise and contribution made to the EA by the Project Team.

Table 5-1. Environmental Assessment Project Team

Name/Education	Experience	Project Role
TVA		
Ashley Pilakowski B.S., Environmental Management	8 years in environmental planning and policy and NEPA compliance	TVA NEPA Project Manager, TVA NEPA Coordinator, NEPA Compliance
Elizabeth Smith B.A., Environmental Studies and Geography	10 years in environmental policy and NEPA compliance	TVA NEPA Project Manager, TVA NEPA Coordinator, NEPA Compliance
Robert Wilson M.S., Biosystems Engineering B.S., Environmental Agriscience	10 years in environmental planning and 5 years in NEPA compliance	Environmental Scientist
Britta Lees M.S., Botany-Wetlands Ecology emphasis; B.A., Biology	14 years in wetlands assessments, botanical surveys, wetlands regulations, and/or NEPA compliance	Wetlands
Michaelyn Harle Ph.D., Anthropology; M.A. Anthropology; B.A. Anthropology	15 years in cultural resource management	Cultural Resources, NHPA Section 106 compliance
Elizabeth Hamrick M.S., Wildlife and Fisheries Science, University of Tennessee B.A. Biology, B.A. Anthropology, Grinnell College	19 years in biological field studies, 8 years in biological compliance, NEPA compliance, and ESA consultation for T&E terrestrial animals.	Terrestrial Zoology
Carrie Williamson, P.E., CFM M.S., Civil Engineering B.S. Civil Engineering	6 years in floodplains and flood risk, 3 years in River Forecasting, 11 years in compliance monitoring	Floodplains and Flood Risk
AECOM		
Roberta A. Hurley M.A., Chemistry; B.S., Chemistry; B.S., Biology	30 years in regulatory and NEPA compliance, including project management and public outreach	EA Project Manager
Erika A. Grace M.S., Environmental Toxicology; B.S., Biological Sciences	11 years in NEPA coordination and document preparation; 13 years in environmental services and technical evaluations	NEPA Project Coordinator, Document Preparation

Table 5-1. Environmental Assessment Project Team

Name/Education	Experience	Project Role
Anneliesa Barta M.B.A. Finance	10 years of experience in Environmental and Sustainability planning, 2 years of experience in NEPA document preparation	Noise, Air Quality and Greenhouse Gas Emissions, Socioeconomics, Environmental Justice
Mike Deacon B.S., Environmental Studies B.S., Environmental Health	28 years of experience in environmental impact assessment, environmental compliance, environmental health, environmental sampling and analysis, natural resource surveys	Land Use, Water Resources, Biological Resources, Visual Resources, Natural Areas and Recreation, Utilities, and Cumulative Impacts
Carol Butler Freeman M.S., Space Studies; M.S., Geological Sciences; B.S., Geology	11 years of experience in NEPA document preparation	Cultural Resources
Laura Owens B.S., Physics and Geology	4 years of experience in in NEPA document preparation; 15 years environmental services	Geology, Soils and Prime Farmland, Transportation

CHAPTER 6

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