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YUM YUM SOLAR ENERGY CENTER
DRAFT ENVIRONMENTAL ASSESSMENT
Fayette County, Tennessee

Prepared by:
Tennessee Valley Authority
Chattanooga, Tennessee

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SYMBOLS, ACRONYMS, AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
AC	Alternating current
ACS	American Community Survey
APE	Area of Potential Effect
ARAP	Aquatic Resource Alteration Permit
AST	Above ground storage tank
ASTM	American Society for Testing and Materials
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BG	Block Group
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best management practice
CAA	Clean Air Act of 1970
CEC	Chickasaw Electric Cooperative
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon monoxide
CT	Census Tract
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibels
DBH	Diameter at breast height
DC	Direct current
DNL	Day-night average sound level
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
EO	Executive Order
EPCRA	Planning and Community Right to Know Act
ESA	Endangered Species Act
ESS	Energy storage system
°F	Fahrenheit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
GHG	Greenhouse gas
HUC	Hydrologic Unit Code
I	Interstate
IPaC	Information for Planning and Conservation

IRP	Integrated Resource Plan
kV	Kilovolt
L&N	Louisville and Nashville Railway Company
LIDAR	Light detection and ranging
M&C	Memphis and Charleston Railroad
M&O	Memphis and Ohio Railroad
MBTA	Migratory Bird Treaty Act
MGD	Million gallons per day
MPT	Main power transformer
MWh	Megawatt hour
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NLCD	National land cover database
NLEB	Northern long-eared bat
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
No.	Number
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NWP	Nationwide Permit
O_3	Ozone
OSHA	Occupational Safety and Health Administration
Pb	Lead
PEM	Palustrine emergent
PFO	Palustrine forested
PMT	Padmount transformer
$PM_{2.5}$	Particulate matter whose particles are less than or equal to 2.5 micrometers
PM_{10}	Particulate matter whose particles are less than or equal to 10 micrometers
PPA	Power purchase agreement
PPE	Personal protective equipment
PRT	Potential Roost Trees
PV	Photovoltaic
REC	Recognized environmental conditions
RNHD	Regional Natural Heritage Database
RCRA	Resource Conservation and Recovery Act
RFP	Request for proposal
ROW	Right-of-way

SHPO	State Historic Preservation Officer
SO_2	Sulfur dioxide
SMZ	Streamside management zone
SPCC	Spill Prevention, Countermeasure and Control
SR	State route
SWPPP	Stormwater Pollution Prevention Plan
TCA	Tennessee Water Quality Control Act
TDEC	Tennessee Department of Environment and Conservation
TDLWD	Tennessee Department of Labor and Workforce Development
TDML	Total Maximum Daily Load
TDOA	Tennessee Department of Archaeology
TDOT	Tennessee Department of Transportation
THC	Tennessee Historical Commission
TL	Transmission line
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method
TWRA	Tennessee Wildlife Resources Agency
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCB	U.S. Census Bureau
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
UST	Underground storage tank
WQC	Water quality certification
WWC	Wet weather conveyance
VOC	Volatile organic compound

CHAPTER 1

1 INTRODUCTION

Tennessee Valley Authority (TVA) has entered into a power purchase agreement (PPA) with Yum Yum Solar LLC (Yum Yum Solar), a subsidiary of Invenergy Solar Project Development, LLC (Invenergy), to purchase the electric power generated by a proposed solar photovoltaic (PV) facility in Fayette County, Tennessee. The proposed Yum Yum Solar Energy Center would be constructed and operated by Yum Yum Solar and would have alternating current (AC) generating capacity of 147 megawatts (MW). In addition to purchasing the electric output under the PPA with Yum Yum Solar, TVA would construct the proposed Yum Yum 161-kV Switching Station, and a 190-foot 161-kV transmission line (TL) would connect the new switching station to TVA's adjacent existing Cordova-South Jackson 161-kV TL. Under the terms of the conditional PPA, dated November 9, 2018, TVA would purchase the electric output from the solar facility for an initial term of 20 years, subject to satisfactory completion of all applicable environmental reviews. Together, the proposed Yum Yum Solar Energy Center and TVA's proposed switching station, TL connection, and PPA with Yum Yum Solar are herein referred to as the "Project" or the "Proposed Action."

The proposed Yum Yum Solar Energy Center would occupy portions of 25 individual tracts of land, which in their entirety encompass nearly 4,003 contiguous acres in rural Fayette County, Tennessee, southwest of the unincorporated community of Yum Yum. Invenergy secured land rights from the owners of the individual tracts to construct the solar facility on their property. The portion of the 25 tracts proposed for solar development encompasses approximately 2,639 acres, herein referred to as the "Project Site" (Figure 1-1 and Figure 2-1). The Yum Yum Solar Energy Center would consist of a solar array containing crystalline silicon PV panels attached to ground-mounted single-axis trackers, central inverters, several medium voltage transformers and one or two main power transformers (MPTs), internal site access roads, and all associated cabling and safety equipment (Figure 2-2 and Figure 2-3). The MPTs would be located within a proposed Project substation and would connect to TVA's existing Cordova-South Jackson 161-kV TL via TVA's proposed Yum Yum 161-kV Switching Station and associated 190-foot TL connection.

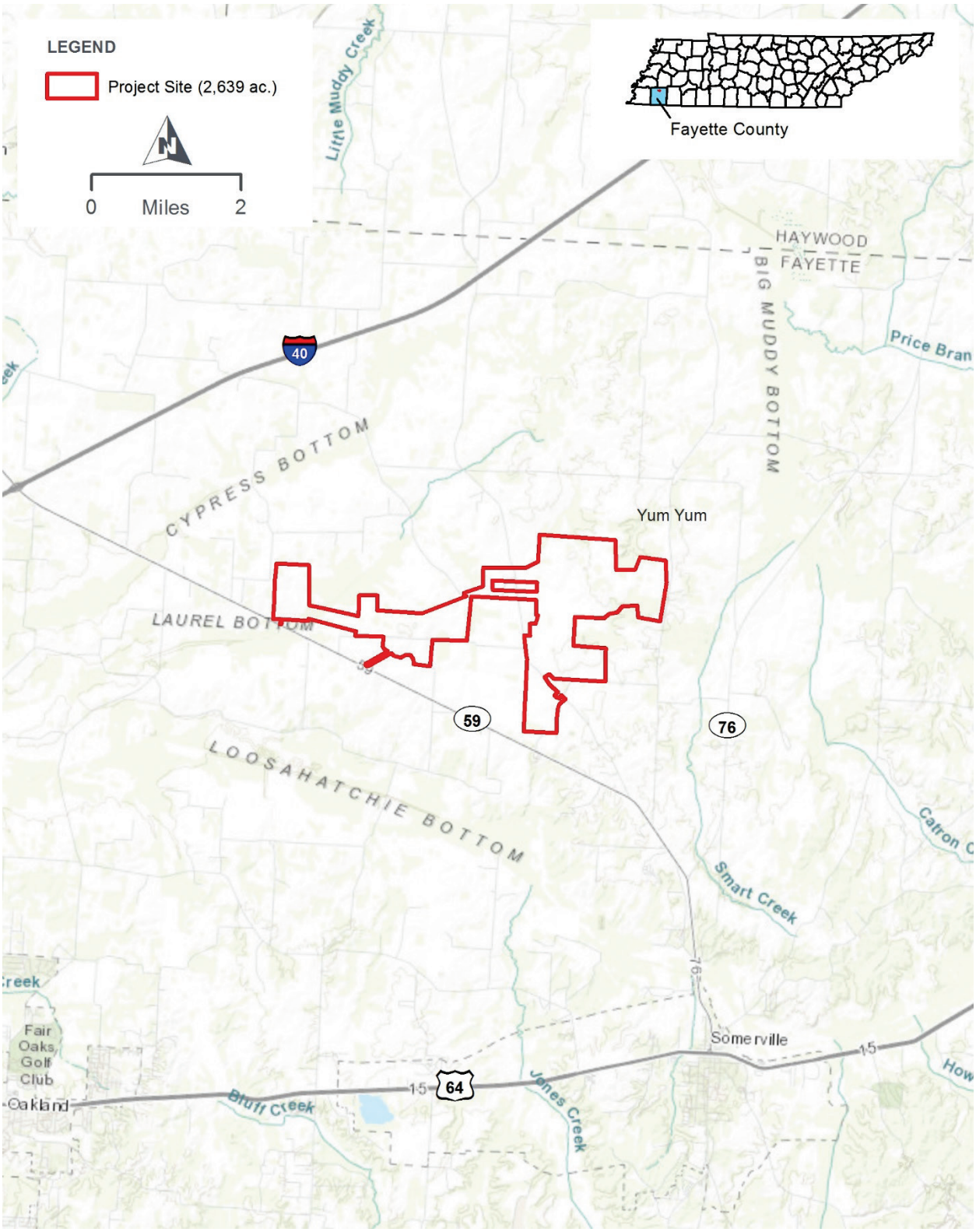

Figure 1-1. Yum Yum Solar Energy Center Project Site in Fayette County, Tennessee

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. 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. The Proposed Action would provide cost-effective renewable energy consistent with the IRP and TVA goals.

In June 2019, TVA released the final 2019 IRP and the associated EIS (TVA 2019a). These documents provide further direction on how TVA can best deliver clean, reliable and affordable energy in the Valley over the next 20 years, and the associated EIS looks at the natural, cultural and socioeconomic impacts associated with the IRP. The 2019 IRP recommends a solar expansion between 1,500 and 8,000 MW of solar by 2028 and up to 14,000 MW by 2038 (TVA 2019a).

1.2 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Pursuant to the National Environmental Policy Act of 1969 (NEPA) and NEPA'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 in accordance with NEPA and TVA's procedures for implementing NEPA (TVA 1983) to assess the potential impacts of the Proposed Action.

TVA's Proposed Action would result in the construction and operation of the proposed solar facility by Yum Yum Solar, including the actions taken by TVA to construct a new switching station and TL to connect the solar facility to the existing TVA transmission system. The scope of this EA, therefore, covers not only impacts related to the construction and operation of the proposed Yum Yum Solar Energy Center but also any impacts related to the associated modifications to the TVA transmission system.

This EA (1) describes the existing environment in the Project Area, (2) analyzes potential environmental impacts associated with the Proposed Action and the No Action Alternative, and (3) identifies and characterizes potential cumulative impacts that could result from the Project in relation to other ongoing or reasonably foreseeable proposed activities within and surrounding

the Project Site. The “Project Area” is the potentially affected area within and beyond the Project Site and varies by each resource area as defined in Chapter 3.

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 impacts of the Project on the human environment and determine whether (a) any significant impacts would result from the location, operation, and/or maintenance of the Project and (b) the Project activities 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 greenhouse gases (GHGs), cultural resources, utilities, waste management, public and occupational health and safety, transportation, socioeconomics, and environmental justice.

This EA consists of six chapters discussing the Project alternatives, resources potentially impacted, and analyses of these impacts. Additionally, this document includes appendices that contain more detail on technical analyses, supporting information, and correspondences. The organization of the EA is as follows:

- **Chapter 1:** 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:** Describes the No Action and Proposed Action Alternatives, provides a comparison of the alternatives, summarizes the proposed mitigation measures covered more fully in Chapter 3, and discusses the Preferred Alternative.
- **Chapter 3:** Discusses the affected environment and the potential direct and indirect impacts on these resource areas. Mitigation measures are also proposed, as appropriate.
- **Chapter 4:** Summarizes unavoidable adverse impacts, the relationship between short-term uses and long-term productivity, and whether the Project makes irreversible and irretrievable commitments of resources. Discusses the cumulative impacts in relation to other ongoing or reasonably foreseeable proposed activities within the Project Area.
- **Chapters 5 and 6:** Contains the list of EA preparers and the references cited in preparation of this EA, respectively.
- **Appendix A:** TVA Right-of-Way 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 Right-of-Way Vegetation Management Guidelines
- **Appendix F:** Correspondence and Supporting Information
- **Appendix G:** TVA Class Review of Repetitive Actions in the 100-Year Floodplain

1.3 PUBLIC AND AGENCY INVOLVEMENT

Yum Yum Solar announced the proposed Yum Yum Solar Energy Center at community meetings in the Town of Somerville in Fayette County, in the late afternoon to early evening on February 19 and 20, 2019. Altogether, 100 people attended these meetings. The intent of the meetings was to introduce Invenergy to the community and provide information on the Project. The shared details included the Project acreage, the Project's electrical output, an overview of tasks necessary to implement the Project, and the potential economic benefits of the Project to the local community.

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 has been posted on the TVA website where comments can also be submitted online. Public notices have been published in local newspapers soliciting comments from other agencies, the general public, and any interested organizations.

1.4 PERMITS AND APPROVALS

1.4.1 Solar Facility

Construction of the Project would require obtaining a Tennessee Department of Environment and Conservation (TDEC) General Construction Stormwater National Pollutant Discharge Elimination System (NPDES) permit (State of Tennessee Permit Number TNR100000). If granted, Permit TNR100000 would authorize stormwater discharges associated with construction activities that result in a total land disturbance of 1 acre or greater, as governed by Section 402 of the Clean Water Act (CWA) (see Section 2.2.22.2.2).

In accordance with TDEC requirements, Yum Yum Solar and the construction contractor would develop a site-specific Stormwater Pollution Prevention Plan (SWPPP) and submit it to TDEC. The SWPPP would address all construction-related activities from the date construction commences to the date of termination of permit coverage. The SWPPP would be prepared in accordance with good engineering practices and would be consistent with the requirements and recommendations contained in the *Tennessee Erosion & Sediment Control Handbook* (TDEC 2012).

Section 404 of the CWA prohibits the discharge of dredged or fill material into Waters of the U.S. (jurisdictional waters), including wetlands and streams unless authorized by the U.S. Army Corps of Engineers (USACE). A CWA Section 404 Nationwide Permit (NWP) Number 14 (Linear

Transportation Projects) would be required for impacts to jurisdictional streams that are greater than or equal to 0.1 acre and less than 0.5 acre for each impact location. Project impacts are expected to occur due to the installation of six road crossings, each estimated to impact no more than 0.07 acre per stream. NWP 14 is a general permit issued by USACE that authorizes discharges of dredged or fill material into Waters of the U.S., including streams and wetlands, provided the activity meets specific criteria for the construction, expansion, or modification of linear transportation projects such as roads. Project impacts are expected to be automatically authorized under NWP 14. However, if the impacts were to exceed 0.5 acre, Yum Yum Solar would apply for a USACE Individual Permit to authorize impacts to Waters of the U.S.

Section 404 permits require water quality certification (WQC) as set forth in Section 401 of the CWA prior to discharging fill materials into Waters of the U.S. Section 401 requires any applicant requesting a federal permit or license for activities that may result in discharges to first obtain a certification from the state that the permitted discharges comply with the state's applicable effluent limitations and water quality standards. In Tennessee, TDEC is responsible for the issuance of WQCs, pursuant to the Tennessee Water Quality Control Act (TCA § 69-3-108, 0400-40-07) and Tennessee's water quality criteria and anti-degradation statement (TCA 0400-40-03). The TDEC Division of Water Resources issues this Section 401 WQC in the form of an Aquatic Resource Alteration Permit (ARAP). Proposed Project impacts would be authorized under the general and special conditions of the TDEC ARAP for Construction or Removal of Minor Road Crossings and the TDEC ARAP for Utility Line Crossings.

Yum Yum Solar would obtain a permit for a septic system and follow standard procedures in installing a proposed Project well. Pursuant to Tennessee Code Annotated §§ 68-221-401.414 and TDEC Rule 0400-48-01, the septic permit would involve submitting an Application for Ground Water Protection Services (Form CN-0971) to estimate water use amounts and to provide the proposed location of the septic system in relation to the proposed well and nearby water features such as drainageways and streams (TDEC 2019a). Yum Yum Solar would comply with this permit to appropriately site the septic system with consideration to required setbacks and TDEC direction. Pursuant to the Tennessee Water Well Act of 1963 and TDEC Rule 0400-45-9, all persons drilling a water well must be licensed and follow standards that ensures groundwater resources are protected (TDEC 2019b). Like septic systems, the licensed well installer must adhere to required setbacks in siting the well. Prior to installing the well, a Notice of Intent (CN-1240) would be filed with TDEC to estimate water use amounts and to provide the proposed location of the water well. Yum Yum Solar and its licensed well installer would comply with required setbacks in order to avoid contamination of groundwater and prevent runoff from entering the well.

The Tennessee Department of Transportation (TDOT) regulates the installation, adjustment, and relocation of utilities in state highway rights-of-way (ROWs) to ensure the integrity, safety, and functionality of state roadways while accommodating utilities. Per the *Rules and Regulations for Accommodating Utilities within Highway Rights-of-Way* (Chapter 1680-6-1), if any portion of the Project requires aboveground or below ground installation within state, federal-aid metro-urban, and state-aid highway system road ROWs, a permit would be obtained from the Region 4 Utilities Office of TDOT.

Vegetative waste from clearing activities would be burned or chipped and ground. If open burning of minimal debris from tree clearing on the site is planned, the appropriate open burning permits would be obtained from the Tennessee Division of Forestry. Information on open or surface burning issued by TDEC would be followed. Only trees and brush from the Project Site would be burned. Weather conditions would be monitored and considered to ensure safety and minimal degradation to air quality during the open burning of any vegetation cleared from the site.

1.4.2 Switching Station and Transmission Interconnection

TVA would obtain an NPDES Construction General Permit from TDEC and develop an SWPPP for construction of the switching station and TL. TVA would prepare the required SWPPP and coordinate with the appropriate state and local authorities. If applicable, TVA would obtain a Section 404 Nationwide or Individual Permit from USACE if switching station or TL construction activities result in the discharge of dredge or fill into waters of the U.S. An ARAP would be obtained from TDEC for any stream or wetland alterations located within the proposed switching station site or TL ROW that may be necessary. A permit may also be required for burning trees and other combustible materials removed during construction. A permit would be obtained from TDOT for the installation of aboveground or below ground Project elements within state, federal-aid metro-urban, and state-aid highway system road ROWs.

CHAPTER 2

2 DESCRIPTION OF THE ALTERNATIVES

This chapter explains the rationale for identifying the alternatives to be evaluated, describes each alternative, provides a comparison of alternatives with respect to their potential environmental impacts, and identifies the Preferred Alternative.

This EA evaluates two alternatives: the No Action Alternative and the Proposed Action Alternative.

2.1 NO ACTION ALTERNATIVE

The No Action Alternative provides a baseline of conditions against which the impacts of the Proposed Action Alternative are measured. Under the No Action Alternative, TVA would not purchase the power generated by the Project under the 20-year PPA with Yum Yum Solar (i.e., TVA would not be involved with the Project), and Yum Yum Solar would not construct or operate the Yum Yum Solar Energy Center. Existing conditions (land use, natural resources, visual resources, physical resources, and socioeconomics) in the Project Area would remain unchanged. TVA would continue to rely on other sources of generation described in the 2019 IRP (TVA 2019a) to ensure an adequate energy supply and to meet its goals for increased renewable energy and low GHG-emitting generation.

2.2 PROPOSED ACTION ALTERNATIVE

Under the Proposed Action Alternative, Yum Yum Solar would construct and operate a 147-MW AC single-axis tracking PV solar power facility in Fayette County, Tennessee. The solar facility would generate approximately 191-MW DC output that would be converted to 147-MW AC output for transmission to the electrical network. The energy generated by the Project would be sold to TVA in accordance with the terms of the PPA. The Project would occupy approximately 2,639 acres of land located on 25 individual parcels immediately southwest of the Yum Yum community. The Project would connect to the TVA electrical network via TVA's adjacent existing Cordova-South Jackson 161-kV TL. Under the Proposed Action, TVA would construct a new, 161-kV switching station northwest of the intersection of Wilson Road and Fowler Drive. A proposed 190-foot 161-kV TL would connect the new switching station to the Cordova-South Jackson 161-kV TL (L5190).

This EA assesses the impact of TVA's action of entering into the PPA with Yum Yum Solar, the associated impacts of the construction and operation of the Yum Yum Solar Energy Center by Yum Yum Solar, and the 161-kV switching station and TL interconnection by TVA.

2.2.1 Project Description

The proposed Yum Yum Solar Energy Center would occupy an approximate 2,639-acre Project Site (Figure 2-1). The Project Site is predominantly flat to gently rolling agricultural land with scattered forested areas immediately southwest of the unincorporated community of Yum Yum. The perimeter of the areas developed into the solar facility would be enclosed by security fencing. The area within the security fencing would consist of approximately 1,624 acres of land and

contain blocks of solar panels and inverters, associated equipment, and infrastructure including a new Project substation, access roads, and electrical cabling. The remaining 1,015 acres of the Project Site, located outside of the fenced-in areas, would be primarily undeveloped. The solar facility would include the proposed TVA Yum Yum 161-kV Switching Station, which would connect to the existing Cordova-South Jackson 161-kV TL via TVA's proposed 190-foot TL connection.

The Project Site is located within a rural agricultural area and is adjacent to several residential farm complexes, some commercial and industrial development, and two residential concentrations, one to the northwest and the other adjacent to the central portion of the Project Site. Undeveloped, forested land exists to the north, east, and south of the Project Site.

Several forested areas primarily associated with water features are scattered across the Project Site, with a concentration of forested land in the northeast portion of the Project Site. Together, the forested areas within the Project Site total approximately 458 acres (17 percent), while the agricultural fields and pasture encompass approximately 2,181 acres (83 percent). The Project Site is a 2,639-acre area composed of portions of 25 contiguous land parcels that together total just under 4,003 acres.

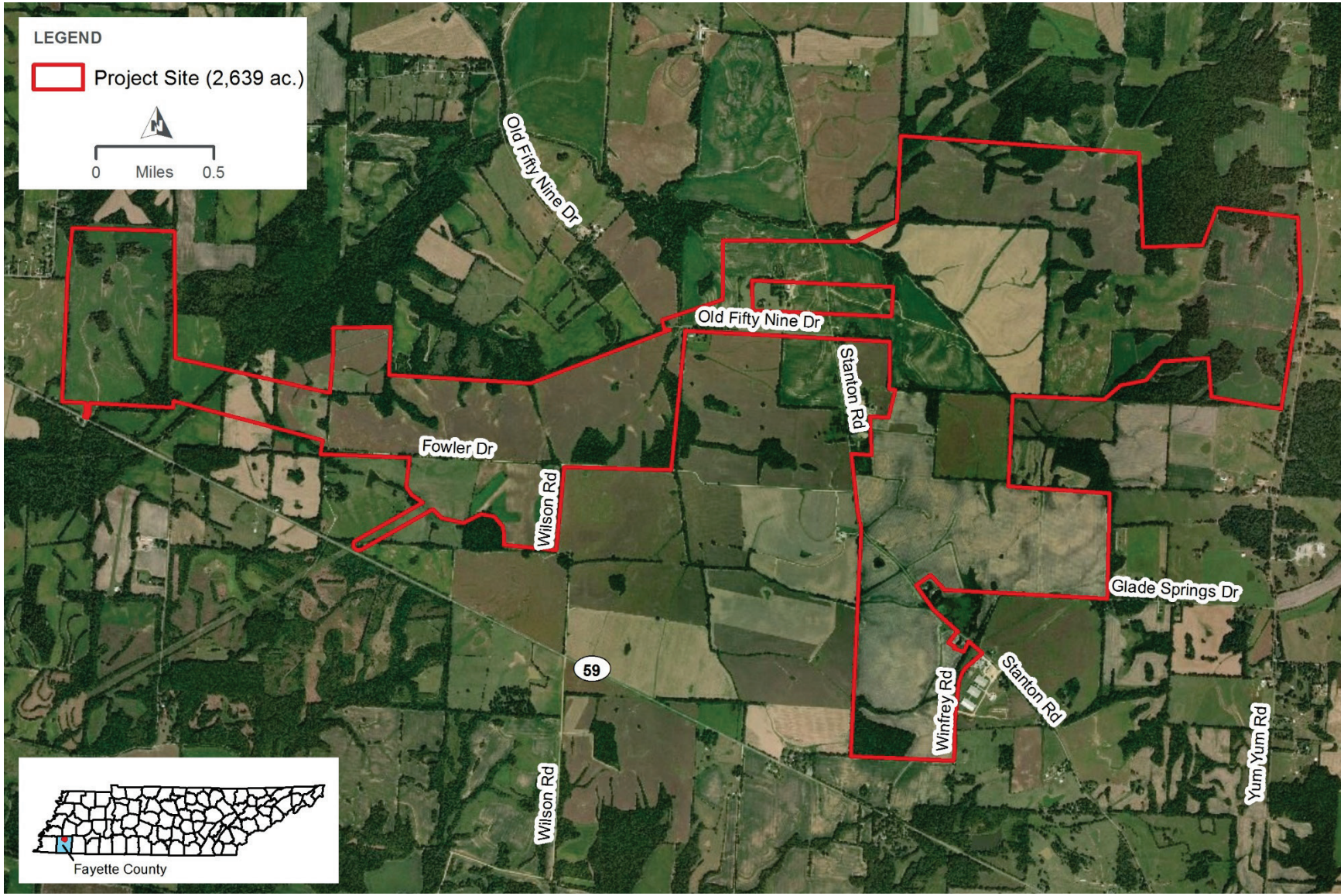

Figure 2-1. Aerial photograph showing Yum Yum Solar Energy Center 2,639-acre Project Site.

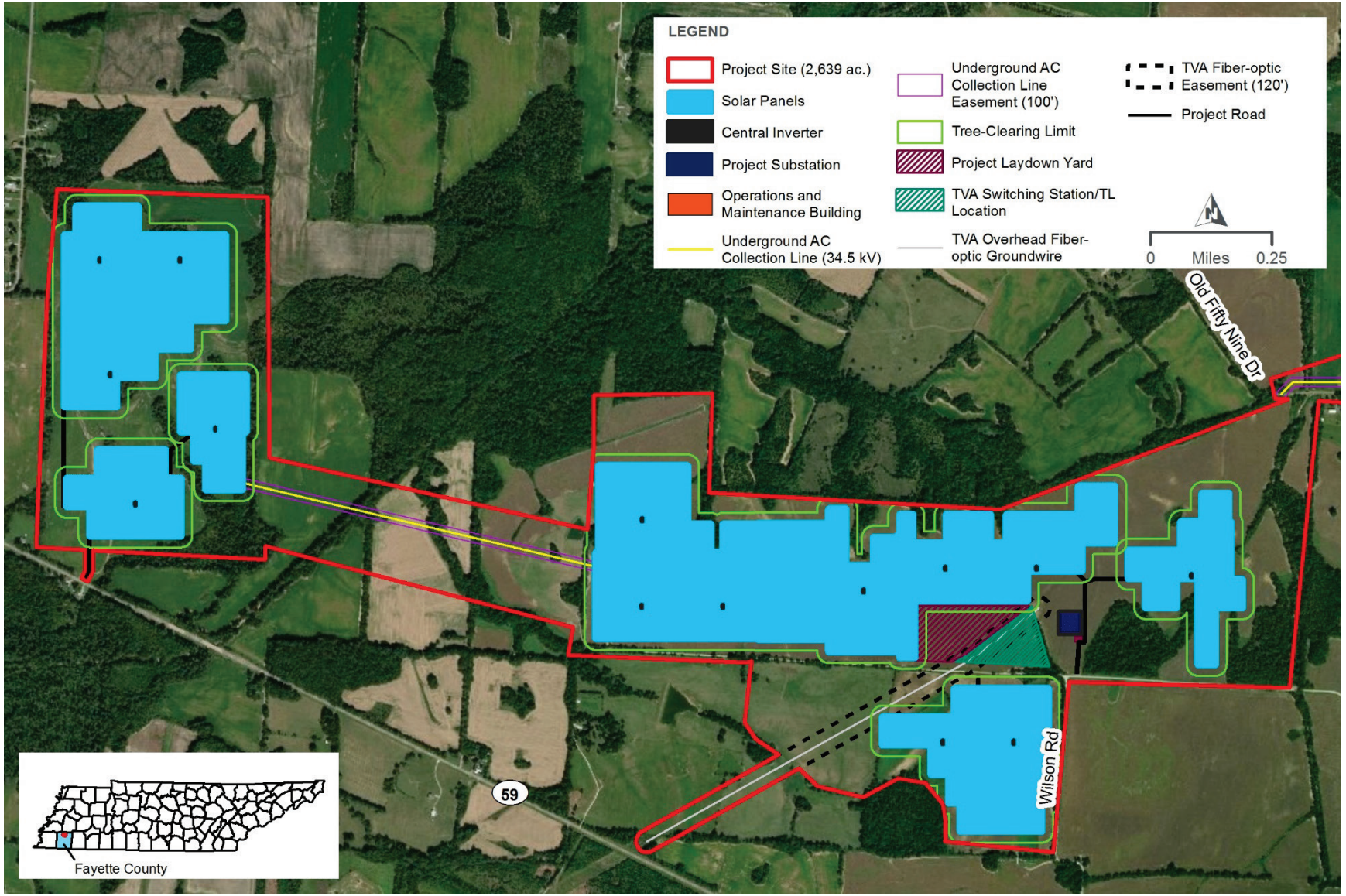

Figure 2-2 West. Aerial photograph showing the proposed layout of the Yum Yum Solar Energy Center components.

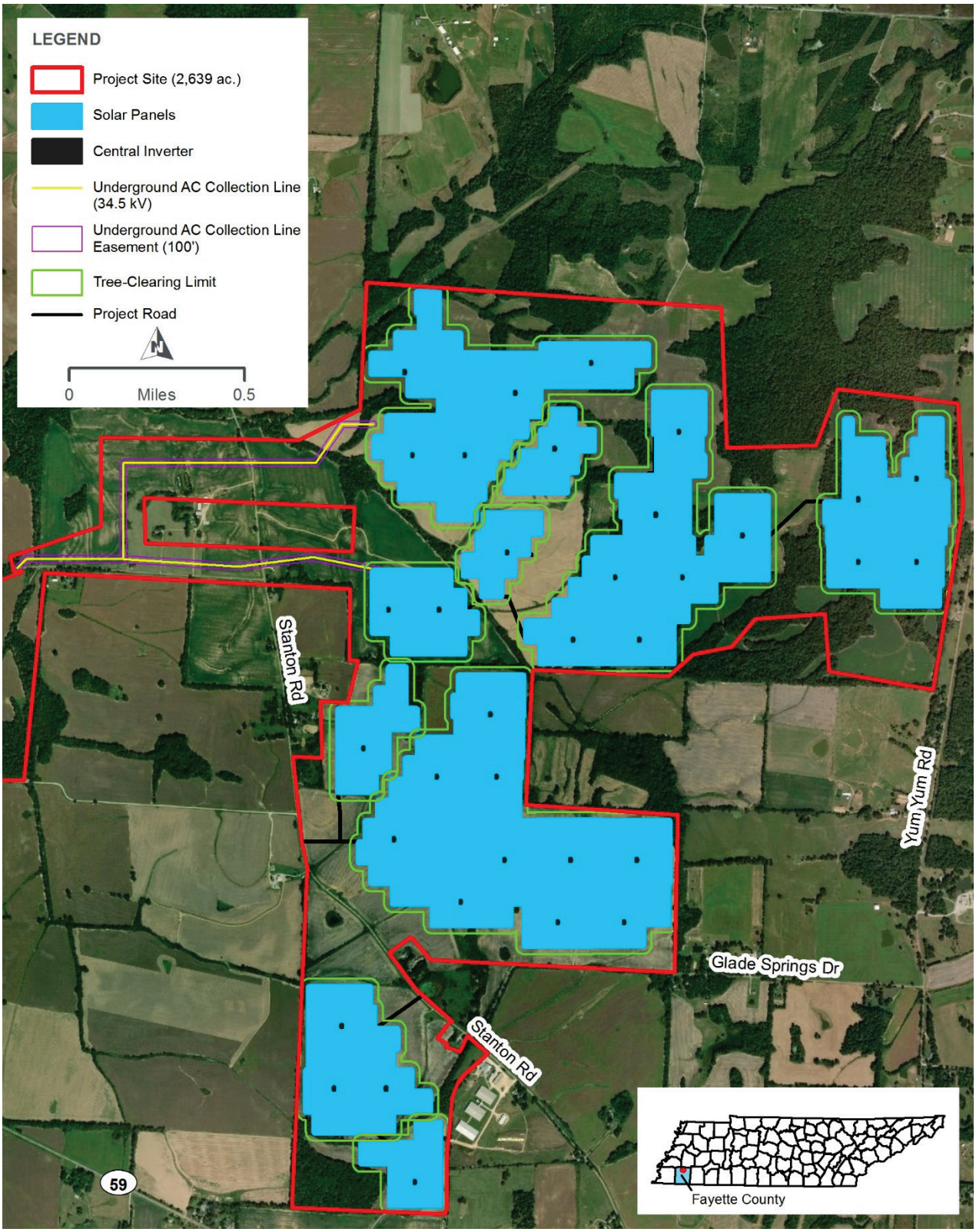

Figure 2-2 East. Aerial photograph showing the proposed layout of the Yum Yum Solar Energy Center components

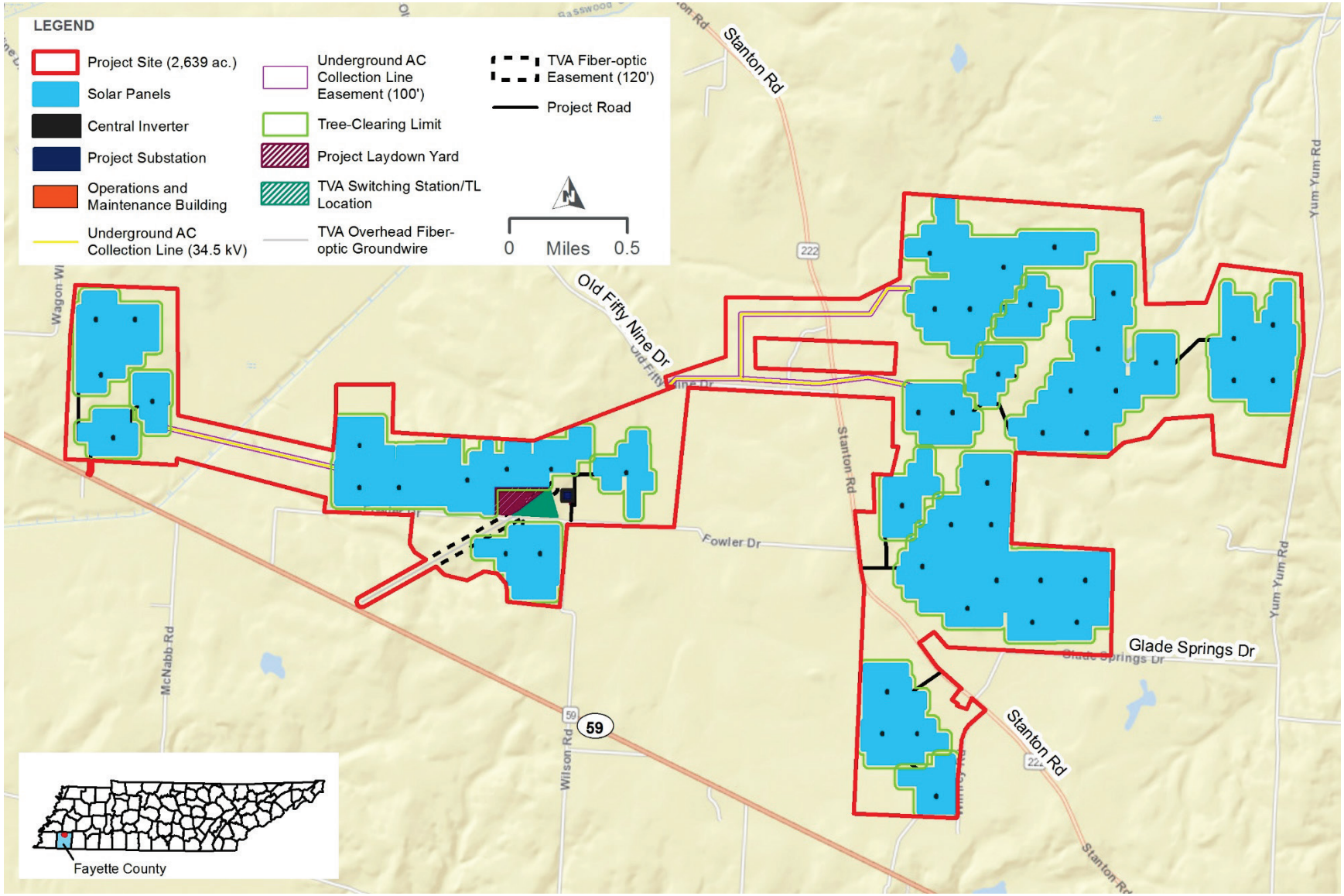

Figure 2-3. Street map showing the proposed layout of the Yum Yum Solar Energy Center components.

The Yum Yum Solar Energy Center would convert sunlight into DC electrical energy within crystalline silicon PV panels (modules) (Figure 2-4). 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 (TVA 2014).

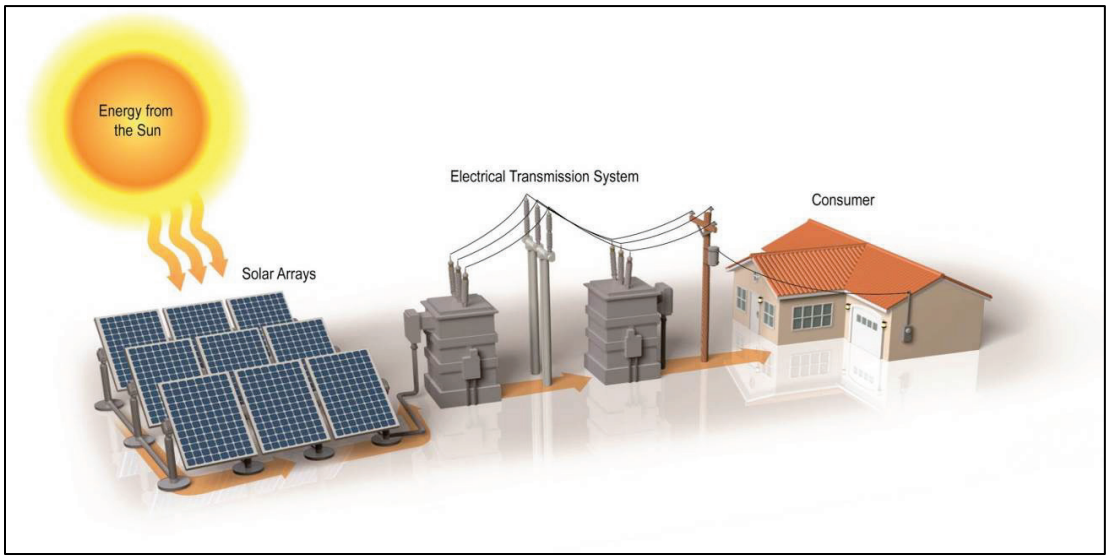

Figure 2-4. General energy flow diagram of PV solar system (not to scale).

The Project would be composed of crystalline silicon PV modules mounted together in arrays. Groups of panels would be connected electrically in series to form "strings" of panels, with the maximum string size chosen to ensure that the maximum inverter input voltage is not exceeded by the string voltage at the Project Site's high design temperature. The panels, estimated to be approximately 8.5 feet by 4.5 feet, would be located in individual blocks consisting of the PV arrays and an inverter station on a concrete pad to convert the DC electricity generated by the solar panels into AC electricity. Module and inverter blocks in close vicinity and not separated by public roads would be enclosed together by chain-link security fencing. The portions of the Project Site outside the fenced-in areas would not be developed.

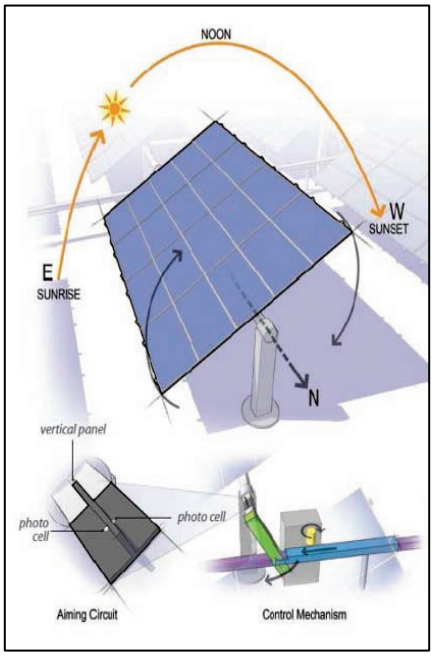

Figure 2-5. Diagram of single-axis tracking system (not to scale)

The modules would be attached to single-axis trackers. The axis trackers would likely be attached to driven steel pile foundations and would be designed to pivot the panels along their north-south axes to follow the path of the sun from the east to the west across the sky (Figure 2-5).

Several strings of panels would be connected by either underground or aboveground DC cabling to a central

inverter, which would convert DC electricity from PV panels into AC so that the energy could be transmitted to the electrical grid. The inverter specification would fully comply with the applicable requirements of the National Electrical Code and Institute of Electrical and Electronics Engineers standards. Each inverter would be adjacent to a padmount transformer (PMT), which would step-up the AC voltage to 34.5-kV in order to minimize the AC cabling electrical losses between the central inverters and the Project substation. Underground AC power cables would connect all of the PMTs to the MPTs, located within the Project substation.

The Project substation would be located adjacent to TVA's proposed Yum Yum 161-kV Switching Station. The Project substation would contain one or two MPTs, disconnect switches, circuit breakers, isolation switches, and a control building. Each required MPT would further step-up the AC voltage from the solar array collection voltage (34.5-kV) to the interconnect voltage (161-kV). High voltage cable jumpers would then connect each MPT through a circuit breaker to the high voltage bus, followed by a short 161-kV transmission line that connects the Project substation to the Project's on-site 161-kV Yum Yum Switching Station constructed by TVA. An additional 190-foot 161-kV TL would connect the new switching station to TVA's adjacent existing Cordova-South Jackson 161-kV TL, between Structures 192 and 193. TVA proposes to add approximately 0.9 miles of fiber-optic groundwire from the proposed Yum Yum Switching Station along the existing Cordova-South Jackson 161-kV TL to Structure 188. The entire 147-MW AC Project energy output would be sold to TVA under the terms of the PPA.

Other Project components would include security equipment, access roads, communications/ Supervisory Control and Data Acquisition equipment, meteorological stations, an operations and maintenance building, and supporting Project water well and septic system located near the operations and maintenance building. Compacted gravel access roads would provide access to each module and inverter block for maintenance and repairs, as well as to the Project substation and operations and maintenance building. Figure 2-2 and Figure 2-3 show the Project Site with major proposed Project elements.

2.2.2 Solar Facility Construction

Construction of the solar power facility generally requires site preparation (surveying and staking, removal of tall vegetation/small trees, light grading/clearing, installation of security fencing around components in vicinity of one another and not separated by public roads, erosion prevention and sediment control BMPs, and preparation of construction laydown areas) prior to solar array assembly and construction, which includes driving steel piles for the tracker support structures, installation of solar panels, and electrical connections and testing/verification.

Yum Yum Solar would 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 consistent slope to the local land. Prior to grading, efforts would be made to preserve native topsoil, which 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, sediment traps, 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 after

construction using a mixture of certified weed-free, low-growing native and/or noninvasive grass and herbaceous plant seed obtained from a reputable seed dealer. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has returned to the preconstruction conditions or the site is stable. Water would be used for soil compaction and dust control during construction.

Grading would consist of the excavation, redistribution, 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 modules, cut-and-fill grading activities would be required to achieve the final design and maximum slope criteria. Efforts will be made to ensure grading at the site results 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. However, some minimal off-site or on-site hauling may be necessary. The 1,624 acres proposed for development of the Project would be cleared to prevent shading of the solar panels and graded for construction and placement of the solar panels, gravel access roads, operations and maintenance building, Project substation, and accompanying electrical components. Open burning or chipping and grinding of minimal debris from the tree clearing on the site would occur to minimize construction wastes. If burning is selected, only vegetation and untreated wood would be burned, and no burning of other construction debris is anticipated.

In accordance with TDEC requirements, a minimum 25-foot buffer surrounding all jurisdictional streams and wetlands would be established as an avoidance measure prior to any clearing, grubbing, grading, or boring activities conducted by the construction contractor. Apart from removal of tall vegetation through nonmechanical means and leaving the roots in place, these buffered areas would be avoided during construction to the greatest extent practicable. Once the buffered areas are marked, construction areas would be cleared and mowed of vegetation and miscellaneous debris. Mowing would continue as needed to contain growth during construction.

To manage stormwater during construction, on-site temporary sedimentation basins, sediment traps, or diversion berms would be constructed within the 1,624-acre disturbed area. If needed, the berm would be constructed along portions of the Project Site perimeter to contain stormwater on site. Any necessary sedimentation basins and traps would be compliant with TDEC requirements. If necessary, sedimentation basins and traps would be constructed either by impoundment of natural depressions or by excavating the existing soil. The floor and embankments of the basins would be allowed to naturally reestablish native vegetation after construction (or replanted as necessary) to provide natural stabilization, minimizing subsequent erosion. Water from the basins would be released into adjacent ditches. All buffered streams and wetlands would be protected by erosion control silt fence, and sediment traps would be placed in strategic drainage areas to prevent sediment from entering on-site streams and wetlands. Off-site sediment migration would be moderated by the placement of silt fence around each area of ground disturbance within the Project Site. These stormwater BMPs would prevent sediment from entering on-site streams and wetlands and prevent sediment migration off site during construction, prior to achievement of final vegetative stabilization.

Approximately 20 acres of the Project Site would be used as construction assembly areas (also called laydown areas) for worker assembly, vehicle parking, and material storage during

construction. Some of these areas would be staged within the areas proposed for the PV arrays. The laydown areas would be on site for the duration of construction. Temporary construction trailers intended for material storage and office space would be parked on site. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed from the Project Site. One operations and maintenance building would remain on site during the life of the Project.

Construction would be sequenced to minimize the time that bare soil on the disturbed areas is exposed. As described above, silt fence would surround the perimeter of each area to be cleared and graded. Other appropriate 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, construction office and laydown areas, ditches, and other Project-specific locations, would be seeded post-construction. If conditions require, soil may be further stabilized by mulch or sprayable fiber mat. If the area seeded is a steep slope (6:1 or greater), hydroseeding may be employed as an alternative. Where required, hay mulch would be applied at 3 tons per acre and well distributed over the area. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has returned to the preconstruction conditions or the site is stable. As part of NPDES permit authorization (see Section 1.4), the site-specific SWPPP would be finalized with the final grading and civil design and would address all construction-related activities prior to construction commencement.

The design of the tracker support structures could vary depending on the final PV technology and vendor selected. Based on preliminary geotechnical survey results for the Project Site, the trackers would likely be attached to driven steel pile foundations. The steel pile foundations are typically galvanized and used where high load bearing capacities are required. The pile is driven with a hydraulic ram. Soil disturbance is restricted to the pile insertion location and to a depth typically less than 20 feet below grade with temporary disturbance from the hydraulic ram machinery, which is about the size of a small tractor. The tracker design and pile foundation design would be stamped by a registered Professional Engineer and Structural Engineer, respectively. Screw piles are another option for PV foundations which are drilled 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 the majority of the components are placed on their respective foundations and structures, electricians and assistants would run the electrical cabling underground throughout the solar field. The trenches for the electrical cabling would be approximately 3 feet deep and 1 to 4 feet wide. The trench would be backfilled with Project-site native soil and then appropriately compacted.

The Project substation would be constructed within an approximate 5-acre location adjacent to TVA's proposed Yum Yum 161-kV Switching Station at the northwest intersection of Wilson Road and Fowler Drive. The Project substation would be surrounded by security fencing. Substation components, including the disconnect switches, circuit breakers, and isolation switches, would be supported by steel racks on concrete foundations. The entire substation location would be graded, as necessary, to ensure that no standing water would affect operations and maintenance of the substation during a storm event. Each required MPT would be supported on a concrete

foundation. An underground or aboveground transmission cable would be constructed to connect each required MPT through a circuit breaker.

After the equipment is electrically connected, electrical service would be tested, motors would be checked, and control logic would be verified. As the solar arrays are installed, the balance of the facility would continue to be constructed and installed, and the controls instrumentation for equipment monitoring would be installed. Once all of the individual systems have been tested, integrated testing of the Project would occur. Electrical interconnection details are provided in Section 2.2.5 below.

The perimeter of Project elements in vicinity of one another would be securely fenced during construction and for the duration of the Project operation with 7-foot-tall fencing consisting of 6-foot tall chain-link fencing topped with three strands of barbed wire. Access to the Project Site would be provided by double-swing gates and access roads. The site would be accessible only to TVA, Invenergy, Yum Yum Solar, and its agents and contractors.

Construction activities would take approximately 20 months to complete using a crew that ranges from 150 to 500 workers. Work would generally occur seven days a week during daylight hours. Additional hours after dark could be necessary to make up schedule deficiencies or to complete critical construction activities. Night-time construction would require lighting in some areas of the Project Site. The lighting would be downward-facing, and timer- and/or motion-activated to minimize impacts to surrounding areas.

2.2.3 Solar Facility Operations

During operation of the solar facility, no major physical disturbance would occur. Moving parts of the solar facility would be restricted to the east-to-west facing tracking motion of the solar modules, which amounts to a movement of less than a one degree angle every few minutes. This movement is barely perceptible. In the late afternoon, module rotation would start to move from west-to-east in a similar slow motion to minimize row-to-row shading. At sunset, the modules would track to a flat or slightly angled stow position. Otherwise, the PV modules would simply collect solar energy and transmit it to the TVA power grid. With the exception of fence repair, vegetation control, and periodic array inspection, repairs, and maintenance, the facility would have relatively little human activity during operation. Water service, sewer service, and permanent lighting is anticipated as an on-site need during operations. The lighting would be downward-facing and timer- and/or motion-activated to minimize impacts to surrounding areas.

During operation, the Yum Yum Solar Energy Center would require up to six full-time staff to manage the facility and conduct regular inspections. Inspections would include identifying any physical damage to panels, wiring, central inverters, padmount transformers, and interconnection equipment, and drawing transformer oil samples. Vegetation on developed portions of the Project Site would be maintained to control growth and prevent overshadowing or shading of the PV panels. Trimming and mowing would likely be performed up to 3 times per year, depending on growth rate, to maintain an appropriate height of approximately 18 inches in order to avoid shading the panels. During operation, selective use of spot herbicides may also be employed around structures to control invasive weeds. Precipitation in the region is adequate to remove dust and

other debris from the PV panels while maintaining energy production; therefore, manual panel washing is not anticipated unless a specific issue is identified.

The proposed solar facility would be monitored remotely to identify any security or operational issues. If a problem is discovered during nonworking hours, a repair crew or law enforcement personnel would be contacted if an immediate response were warranted.

2.2.4 Decommissioning and Reclamation

The Project would operate and sell power to TVA pursuant to the terms of the PPA for 20 years from the commercial operation date of the facility. At the end of the PPA term, Yum Yum Solar would assess whether to cease operations at the Project Site, replace equipment and attempt to enter into a new PPA, or make some other arrangement to sell the power. If operations ceased, the facility would be decommissioned and dismantled, and the Project Site would be restored per Project decommissioning requirements. In general, the majority of decommissioned equipment and materials would be recycled. Materials that cannot be recycled would be disposed of at an approved facility. Because the lease agreements with landowners are for 35 years, site control would be maintained for longer than the 20-year PPA term, and Yum Yum Solar may attempt to renegotiate an additional or extended PPA with TVA. Any additional PPA with TVA would be evaluated through separate NEPA processes.

2.2.5 TVA Electrical Interconnection

Under the Proposed Action, TVA would construct the Yum Yum 161-kV Switching Station northwest of the intersection of Wilson Road and Fowler Drive. A short 161-kV TL would connect the station between Structures 192 and 193 of TVA's adjacent existing Cordova-South Jackson 161-kV TL, as illustrated in Figure 2-6. The new TL would be approximately 190 feet in length and constructed within the switching station property footprint.

To facilitate the operation of the Yum Yum Solar Energy Center and TL connection, TVA proposes to undertake the following additional activities:

- Installation of approximately 0.9 mile (4,981.7 feet) of fiber-optic overhead ground wire on the existing Cordova-South Jackson 161-kV TL from the proposed Yum Yum 161-kV Switching Station southwest to Structure 188 adjacent to State Route (SR) 59;
- Installation of telecommunications connections at the Cordova 500-kV Substation and South Jackson 161-kV Substation; and
- Modification of TVA map boards to include names and numbers of the new TL and Yum Yum 161-kV Switching Station.

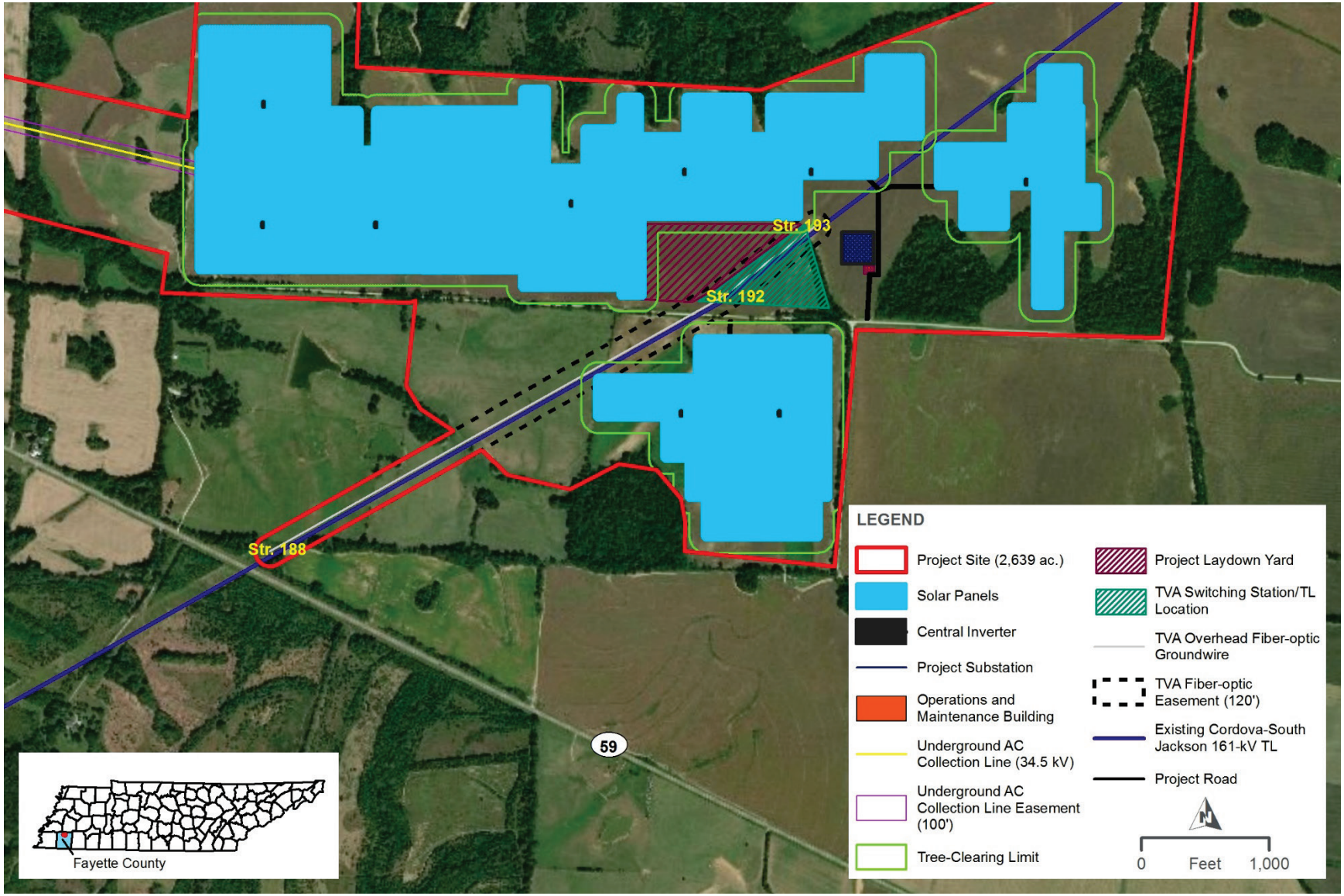

Figure 2-6. Detail of the proposed TVA Yum Yum 161-kV Switching Station and Transmission Line.

2.2.5.1 Switching Station Construction

TVA proposes to construct a switching station encompassing approximately 7.5 acres adjacent to the Cordova-South Jackson TL (Figure 2-6). Three 161-kV breakers would be installed in a ring bus configuration along with associated metering, communication, and protective equipment. TVA would also install a switch house.

TVA would clear vegetation on the switching station site, remove the topsoil, and grade the property in accordance with TVA's *Site Clearing and Grading Specifications* (TVA 2017a). Limited clearing will occur, as the site is predominantly cropland. In areas where there is a need to clear trees, equipment used could include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. As necessary, any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site. Prior to burning, TVA would obtain any necessary permits. In some instances, vegetation may be windrowed along the edge of the Project Site to serve as sediment barriers. Further guidance for clearing and construction activities can be found in Appendix A, Appendix B, Appendix C, and TVA's BMP manual (TVA 2017b).

2.2.5.2 Right-of-Way Acquisition and Clearing

A ROW utilizes an easement that would be designated for a TL and associated assets. The easement would require maintenance to avoid the risk of fires and other accidents and to ensure reliable operation of the facility. The ROW provides a safety margin between the high-voltage conductors and surrounding structures and vegetation. TVA typically purchases easements from the landowner whose land the proposed new ROW would cross. In this particular case, however, the switching station property extends underneath the existing Cordova-South Jackson 161-kV TL. As such, the TL connection would be constructed entirely within the proposed switching station property boundary, and proper clearance requirements would be met without the purchase of additional ROW. The existing easement designated for the TL connection provides for the right to clear the ROW, construct, operate, and maintain the TL, and remove "danger trees" adjacent to the ROW. Danger trees include any trees located off the ROW that, under maximum sag and blowout conditions, would strike a TL structure or come within an unsafe distance of a TL if it were to fall toward the TL. For most TLs, this distance is 5 feet, but for higher voltage TLs, the distance is generally 10 feet.

The area in which the proposed TL connection would be built is located within the proposed switching station property and is predominantly cropland as described above in Section 2.2.5.1. Due to the proposed construction sequencing, area designated for the TL ROW would be cleared as a part of the initial switching station effort.

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 handheld equipment or remote-handling equipment, such as a feller-buncher, to limit ground disturbance.

TVA utilizes standard practices for ROW clearing and construction activities. These guidance and specification documents are taken into account when considering the effects of the Proposed Action and include:

- *TVA ROW Clearing Specifications*,
- *TVA Environmental Quality Protection Specifications for Transmission Line Construction*,
- *TVA Transmission Construction Guidelines Near Streams*,
- *TVA Environmental Quality Protection Specifications for Transmission Substation or Communications Construction*, and
- *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities – Revision 3 – 2017* (2017b).

All of these documents are available on TVA's transmission system projects web page (TVA 2019b), and all but the final, more lengthy document are provided herein as appendices (Appendix A, Appendix B, Appendix C, and Appendix D). TVA transmission projects also utilize BMPs to provide guidance for clearing and construction activities.

Following clearing and construction of both the switching station and TL connection, an appropriate vegetative cover on the ROW would be restored. TVA would utilize appropriate seed mixtures as described in TVA's 2017 BMP manual (TVA 2017b). Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in the above guidance documents. Failure to maintain adequate clearance within the ROW can result in dangerous situations, including ground faults. As such, native vegetation or plants with favorable growth patterns (slow growth and low mature heights) would be maintained within the ROW following construction in accordance with BMPs.

2.2.5.3 Access Roads

Access roads would be needed to allow vehicular access to each structure and other points along the ROW. Typically, new permanent or temporary access roads used for TLs are located on the ROW whenever possible and are designed and located to avoid severe slope conditions and to minimize impacts to environmental resources such as streams. Access roads are typically about 12- to 16-feet wide and are surfaced with dirt, mulch, or gravel. Permanent access to the Yum Yum 161-kV Switching Station would be off of Fowler Road.

Culverts and other drainage devices, fences, and gates would be installed as necessary at the Project Site. Culverts installed in any perennial streams would be removed following construction. However, in ephemeral streams, the culverts would be left or removed, depending on the wishes of the landowner or any permit conditions that might apply. If desired by the property owner, TVA would restore new temporary access roads to previous conditions. Additional applicable ROW clearing and environmental quality protection specifications are provided in Appendix A, Appendix B, and Appendix C.

2.2.5.4 Construction Assembly Areas

A construction assembly area, or "laydown area," would be required for worker assembly, vehicle parking, and material storage. This could be shared with the laydown area proposed for the Yum Yum Solar Energy Center, as depicted on Figure 2-6, or TVA may elect to lease a separate laydown area from a private landowner for the duration of the construction period. Properties

utilized for laydown areas are typically leased by TVA approximately one month before construction begins and would be subject to additional environmental review prior to use.

Depending on site conditions, some minor grading and installation of drainage structures, such as culverts, may be required. The areas would be graveled, as needed, and fenced. Trailers used during the construction process for material storage and office space could be parked at these locations. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed. Removal of TVA-installed fencing and site restoration would be performed by TVA if desired by the landowners.

2.2.5.5 Structures and Conductor

The proposed TL would utilize two single-pole structures, approximately 80 feet in height, at the connection point to the existing Cordova-South Jackson 161-kV TL. A three-pole structure would be utilized to connect to the Yum Yum Solar Energy Center. Examples of these structure types are shown in Photo 2.2-1 and Photo 2.2-2.

Photo 2.2-1. Typical single-pole structure

Photo 2.2-2. Example of three-pole structure

Three conductors (the cables that carry the electrical current) are required to make up a single circuit in alternating current TLs. For a 161-kV TL, each single-cable conductor is attached to porcelain insulators that are either suspended from the structure cross arms or attached directly to the structure. A smaller overhead ground wire or wires are attached to the top of the structures.

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

Equipment used during the construction phase would include trucks, truck-mounted augers, drills, and excavators, 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 per TVA BMPs.

2.2.5.6 Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to the construction assembly area(s). A small rope would be pulled from structure to structure. The rope would be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys.

2.2.5.7 Inspection

Periodic inspections of 161-kV TLs are performed by helicopter aerial surveillance after operation begins. Foot patrols or climbing inspections are performed 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 that immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

2.2.5.8 Vegetative Management

Management of vegetation along the ROW would be necessary to ensure access to structures and to maintain an adequate distance between TL conductors and vegetation. Adequate ground clearance is important for construction, design, and survey tolerances (e.g., conductor sagging). TVA uses more conservative distances for clearance than National Electrical Safety Code requirements in order to ensure reliability. TVA uses a minimum ground clearance of 24 feet for a 161-kV TL at the maximum line operating temperature. The *Transmission System Vegetation Management Draft Programmatic EIS* (TVA 2018) is projected to be finalized in 2019. At that time, the EIS will outline the preferred vegetation management alternative. Until then, vegetation management is governed by the injunction order currently in place in the *Sherwood v. TVA* litigation, under which TVA has stopped removing woody vegetation except for trees that are an immediate hazard (TVA 2017c). Upon court approval of the EIS, vegetation management along the ROW would consist of two different activities: felling trees adjacent to the cleared ROW and controlling vegetation within the total width of the cleared ROW. These activities would occur periodically as identified by Light Detection and Ranging (LIDAR) inspections.

After tall trees and other tall-growing vegetation are removed from the ROW during construction, routine management of vegetation within the cleared ROW would include an integrated vegetation management approach designed to encourage low-growing plant species and discourage tall-growing plant species. A vegetation maintenance plan would be developed for each TL sector, based on the results of the periodic inspections described above. Vegetation control methods or tools and their appropriate uses for various TL ROW conditions are described in TVA's

Transmission System Vegetation Management Draft Programmatic EIS (TVA 2018). These methods include utilizing hand tools, mechanical cutting and trimming with larger equipment, and herbicide spraying and growth regulators. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical or manual methods are not practical.

Herbicides can be applied in a variety of ways; however, all herbicides would be applied under the supervision of a licensed applicator in accordance with applicable state and federal laws and regulations. Additionally, only TVA-approved herbicides registered with the U.S. Environmental Protection Agency (USEPA) or those approved by another managing agency as appropriate would be used and applied in accordance with the manufacturers' label directions. A list of the herbicides currently used by TVA in ROW vegetation control and pre-emergent herbicides TVA currently uses on bare ground areas in TL ROWs is presented in TVA's *Right-Of-Way Vegetation Management Guideline*s, provided in Appendix E. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

2.2.5.9 Structure Replacement

Other than vegetation management within ROWs, only minor maintenance work is generally required once TL structures and other components (e.g., conductor, insulators, arms) are installed, as these typically last several decades. In the event that a structure needs to be replaced, the structure would normally be lifted out of the ground by crane-like equipment. The replacement structure would be inserted into the same hole or an adjacent hole. Access to the structures would be via existing roads. Replacement of structures may require leveling the area surrounding the replaced structures, but additional area disturbance would be minor compared to the initial installation of the structure.

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 IRP (TVA 2015), multiple factors were considered when screening potential locations and ultimately eliminating those sites that did not have the needed attributes. This process of review and refinement ultimately led to the consideration of the Project Site.

The site screening process consisted of general solar resource screening within TVA's service area, including ensuring the availability of nearby electric infrastructure for interconnection to TVA's system with sufficient available transmission capacity for the proposed solar facility. Additional site screening consisted of identifying suitable large-scale landscape features that would allow for utility-scale solar development such as:

- 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, with minimal and/or avoidable floodplains or large forested or wetland areas;

- Large contiguous parcels of land with appropriate local zoning regulations and located away from densely populated areas; and
- Ability to avoid and/or minimize impacts to known sensitive biological, visual, and cultural resources.

2.4 COMPARISON OF ALTERNATIVES

This EA evaluates the potential environmental effects that could result from implementing the No Action Alternative or the Proposed Action Alternative at the proposed solar facility in Fayette County, Tennessee. The analysis of impacts in this EA is based on the current and potential future conditions on the properties and within the surrounding region. A comparison of the impacts of the alternatives is provided in Table 2-1.

Table 2-1. Comparison of impacts by alternative.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Land Use	No direct or indirect impacts anticipated.	Minor direct adverse impacts on land use due to change from agricultural to solar; however, solar power is considered a special exception land use in this portion of Fayette County. No indirect effects on land use.
Geology, Soils, and Prime Farmlands	No direct or indirect impacts anticipated.	Soils: Minor direct impacts to geology and soils, resulting from minor to minimal increases in erosion and sedimentation during construction and operation. While in operation, adverse impacts to soils would be partially offset by beneficial effects to soil health with the use of native and/or noninvasive vegetation. Farmlands: Minor direct adverse impacts from removal of 929 acres of prime farmland from potential agricultural use for the duration of the Project.
Water Resources	No direct or indirect impacts anticipated.	Groundwater: No direct adverse impacts anticipated; minor beneficial indirect impacts to groundwater due to reduction in fertilizer and pesticide use and planting of native vegetation. Surface water: Minor direct impacts to up to six streams (0.42 acre) due to road crossings and up to 63 wet weather conveyances (WWCs) (34,920 linear feet) due to placement of solar panels; minor beneficial indirect impacts to groundwater due to reduction in fertilizer and pesticide use compared with current agricultural use. No direct impacts to wetlands. Floodplains: No significant impact on floodplains and their natural and beneficial values.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Biological Resources	No direct or indirect impacts anticipated.	Vegetation: Minor direct impacts to vegetation by clearing of up to approximately 150 acres of trees and other tall vegetation within the 1,624-acre portion of the Project Site proposed for development and revegetating this portion of the Project Site. Wildlife: Minor impacts to wildlife due to changes to habitat; direct and indirect effects on common migratory birds and mammal species; the Project is not anticipated to adversely affect migratory bird species of concern; minor impacts on common wildlife species due to the existence of Project components and increased human presence. Rare, Threatened and Endangered Species: Project is not likely to adversely affect federally or state-listed species.
Visual Resources	No direct or indirect impacts anticipated.	Temporary, minor impacts on visual resources due to increased traffic during the construction phase. Minor adverse direct impacts to visual resources during operation due to substantial tree buffers around the site.
Noise	No direct or indirect impacts anticipated.	Minor, temporary minor adverse impacts would occur during construction. Minimal to negligible impacts during operation and maintenance.
Air Quality and Greenhouse Gas Emissions	No direct or indirect impacts anticipated.	Minor direct impacts to air quality would be anticipated as a result of construction of the Project. No negative impacts to air quality as a result of operation of the project. Temporary impacts to GHG emissions expected during construction would be negligible. Offsetting beneficial effects would also occur, due to the nearly emissions-free power generated by the solar facility, offsetting power that would otherwise be generated by the combustion of fossil fuels.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Cultural Resources	No direct or indirect impacts anticipated.	Archaeological Resources: No impacts on any NRHP-listed or eligible archaeological sites. Architectural Resources: Recommendation of no adverse effect on architectural resources.
Utilities	No direct or indirect impacts anticipated.	Potential short-term adverse impacts to local utilities (electricity, telecommunication connections) when bringing the solar facility on-line or during routine maintenance of the facility. No long-term adverse impacts are anticipated. Long-term beneficial impact to electrical services across the region.
Waste Management	No direct or indirect impacts anticipated.	No adverse effects to waste management are anticipated with the use of BMPs.
Public and Occupational Health and Safety	No direct or indirect impacts anticipated.	Minor, temporary adverse impacts during construction. No public health or safety hazards would be anticipated as a result of operation.
Transportation	No direct or indirect impacts anticipated.	Direct impacts to transportation during construction would be anticipated to be minor to moderate and minimized or mitigated. Minimal direct impacts to transportation during operation. No indirect impacts to transportation.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Socioeconomics	No direct or indirect impacts anticipated.	Short-term beneficial economic impacts would result from construction, including the purchase of materials, equipment, and services and a temporary increase in employment, income, and population. Positive, long-term, direct impacts to economics and population from Project operation. The local tax base would increase from construction of the solar facility and would be beneficial to Fayette County and the vicinity.
Environmental Justice	No direct or indirect impacts anticipated.	No disproportionately high or adverse direct or indirect impacts on minority or low-income populations.

2.5 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

Yum Yum Solar would implement minimization and mitigation measures in relation to resources potentially affected by the Project. These would be developed consistent with BMPs, permit requirements, and adherence to the SWPPP.

In association with the proposed electrical interconnection, TVA would employ standard practices and specific routine measures to avoid and minimize impacts to resources. These practices and measures are summarized in this section.

2.5.1 Yum Yum Solar Energy Center

Yum Yum Solar would implement the following minimization and mitigation measures in relation to potentially affected resources:

- Land use and visual resources
    - Install anti-reflective, PV panel surfaces to minimize or eliminate negative visual impacts such as glare and reflection;
    - If required by Fayette County, make landscape plantings where needed surrounding the Project Site to minimize visual effects from the Project;
- Geology and soils
    - Install silt fence along the perimeter of vegetation-cleared areas,
    - Implement other soil stabilization and vegetation management measures to reduce the potential for soil erosion during site operation,
    - Endeavor to balance cut-and-fill quantities to alleviate the transportation of soils off-site during construction;
- Water resources
    - Comply with the terms of the SWPPP prepared as part of the NPDES permitting process,
    - Use BMPs for controlling soil erosion and runoff, such as the use of 25-foot buffer zones surrounding streams and wetlands and the installation of erosion control silt fences and sediment traps,
    - Implement other routine BMPs as necessary, such as nonmechanical tree removal within surface water buffers, placement of silt fence and sediment traps along buffer edges, selective herbicide treatment to restrict application near receiving water features, and proper vehicle maintenance to reduce the potential for adverse impacts to groundwater;
    - Comply with the Fayette County Floodplain Ordinance as well as permits and requirements associated with the proposed Project septic system and water well;
- Biological resources
    - Revegetate with native and/or noninvasive vegetation to reintroduce habitat and limit the spread of invasive species;
    - Use of timer and/or motion-activated lighting to limit attracting wildlife, particularly migratory birds;
    - Instruct personnel on wildlife resource protection measures, including (1) applicable federal and state laws such as those that prohibit animal disturbance,

collection, or removal, (2) the importance of protecting wildlife resources, and (3) avoiding plant disturbance;
    - Avoid impacts to nesting birds by clearing trees and shrubs outside of nesting season;
    - Consult with the Tennessee Wildlife Resource Agency to address wildlife concerns that may arise;
- Noise
    - Primarily conduct construction work during daylight hours to reduce noise impacts in Project Area;
- Waste Management
    - Develop and implement a variety of plans and programs to ensure safe handling, storage, and use of hazardous materials;
- Public and Occupational Health and Safety
    - Emphasis on BMPs for site safety management to minimize potential risks to workers;
    - Establish and maintain health and safety plans in compliance with OSHA regulations; and
- Transportation
    - Implement staggered work shifts during daylight hours and a flag person during heavy commute periods to manage traffic flow near the Project Site.

2.5.2 TVA Electrical Interconnection

TVA employs standard practices when constructing, operating, and maintaining transmission lines, structures, and the associated ROW and access roads. These can be found on TVA's transmission website (TVA 2019b). Some of the more specific routine measures that would be taken to reduce the potential for adverse environmental effects during the construction, operation, and maintenance of the proposed transmission line and access roads are as follows:

- TVA would utilize standard BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities – Revision 3*, TVA's BMP manual (TVA 2017b) , and TDEC's *Tennessee Erosion & Sediment Control Handbook* (TDEC 2012) to minimize erosion during construction, operation, and maintenance activities.
- To minimize the introduction and spread of invasive species in the ROW, access roads and adjacent areas, TVA would follow standard operating procedures consistent with Executive Order (E.O.) 13112 (Invasive Species) for revegetating the areas with noninvasive plant species as defined by TVA (2017b).
- Ephemeral streams that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in TVA (2017b) and TDEC's *Erosion & Sediment Control Handbook* (TDEC 2012).
- Perennial and intermittent streams would be protected by the implementation of Standard Stream Protection (Category A), Protection of Important Steams, Springs, and

Sinkholes (Category B), or Protection of Unique Habitat (Category C) as defined by TVA (2017b).

- In areas requiring chemical treatment, only USEPA-registered and TVA approved herbicides would be used in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic impacts.
- To minimize adverse impacts on natural and beneficial floodplain values, the following mitigation measures would be implemented:
    - BMPs would be used during construction activities;
    - Construction activities would adhere to the TVA subclass review criteria for transmission line location in floodplains;
    - If hauled off-site for disposal, excavated material would be spoiled outside the 100-year floodway; and
    - Construction or improvement of access roads would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.

2.6 THE PREFERRED ALTERNATIVE

TVA's preferred alternative for fulfilling its purpose and need is the Proposed Action Alternative. This alternative would generate renewable energy for TVA and its customers with only minor direct and indirect environmental impacts due to the implementation of BMPs and minimization and mitigation efforts, as described in Section 2.5.1 and Section 2.5.2. Implementation of the Project would help meet TVA's renewable energy goals and would help TVA meet future energy demands on the TVA system.

CHAPTER 3

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

3.1 LAND USE

This section describes an overview of existing land use in the Project Area and potential impacts to land use associated with the No Action and Proposed Action Alternatives.

3.1.1 Affected Environment

Land use is defined as the way people use and develop land, including leaving land undeveloped or using land for agricultural, residential, commercial, and industrial purposes. Fayette County develops zoning ordinances and planning documents to control the direction of development and to concentrate similar land uses in the county. The county's *City & County Growth Plan* identifies the Somerville Urban Growth Boundary extending from Somerville northward to the junction of SR 59 and SR 76; however, this does not extend into the Project Site (Fayette County 2009). Likewise, the plan shows a Planned Growth Area at the intersection of Interstate (I-) 40 and SR 59, outside of the Project Site, near the Town of Braden. Both of these growth areas are approximately two miles from the Project Site. The Project Area and, generally, the northern portion of Fayette County, within which the Project Site lies, remains designated as rural, and use for solar PV facilities is permitted as a special exception (Fayette County 2017). Images generated with the National Land Cover Database (NLCD) evaluation, visualization, and analysis tool show the Project Site as primarily cultivated crops and pastures with scattered areas of woody wetlands and some deciduous forest (Figure 3-1).

The 2,639-acre Project Site consists of flat to gently rolling terrain that ranges in elevation from approximately 360 to 430 feet above mean sea level. Topography is highest on the northeast portion of the Project Site, decreasing toward the southwest. Approximately one percent (34 acres) of the Project Site contains pervious and impervious roads, various buildings providing agricultural support, and scattered residences. Approximately 83 percent (2,181 acres) of the Project Site's total area is open agricultural fields, pastures, or developed open land. The remaining, approximately 17 percent (458 acres) of the Project Site consists of small forested or scrub/shrub areas primarily associated with water features. Two overhead TLs, including the TVA Cordova-South Jackson 161-kV TL, and a buried gas pipeline traverse the Project Site in a northeast-southwest direction.

SR 59 extends along portions of the southwestern boundary of the Project Site, and Yum Yum Road generally frames the eastern boundary of the Project Site. Stanton Road (SR 222) extends north-south through the central portion of the Project Site. Agricultural, rural-residential, and undeveloped land uses dominate the landscape for at least two miles in all directions from the

Project Site. Oak Grove Gin and Warehouse, an agricultural processing complex containing several large warehouses and other buildings, is located adjacent to the southeast corner of the Project Site, to the south of SR 222. Along SR 222 north of Oak Grove Gin, between Fowler Drive and Old 59 Drive, a small residential concentration is adjacent to the central portion of the Project Site, primarily along the east side of SR 222. Another small residential concentration exists along Wagon Wheel Road, adjacent to the western portion of the Project Site and north of SR 59. The unincorporated community of Yum Yum is approximately 0.5 mile northeast of the Project Site. The Fayette County Industrial Park is located along SR 59 approximately 2.0 miles to the southeast of the Project Site. At its nearest point, I-40 is approximately 2.5 miles to the northwest of the Project Site. No parks or other public outdoor recreation facilities occur in the Project Area. The closest municipality, approximately five miles to the south-southeast of the Project Site, is the Town of Somerville, where approximately 3,100 people reside (U.S. Census Bureau [USCB] 2019).

Available historical aerial photographs and topographic quadrangles document that land use in the Project Area has remained relatively unchanged, at least since the early 1950s but likely earlier, based on historical trends (U.S. Geological Service [USGS] 2019a and 2019b). Throughout this time, land uses in the Project Area have been primarily agricultural and rural-residential, and major elements, such as SR 59, SR 222, Yum Yum Road, portions of Oak Grove Gin and Warehouse, and some TLs were present. Primary changes between the 1950s and 2010s include the addition of more local roads, some small buildings, and a few agricultural ponds, and expansion of Oak Grove Gin. The centrally located residential concentration along SR 222 was largely developed by the early 1980s; the residential concentration along Wagon Wheel Road in the western portion of the Project Area began to be more densely developed by the late 1990s.

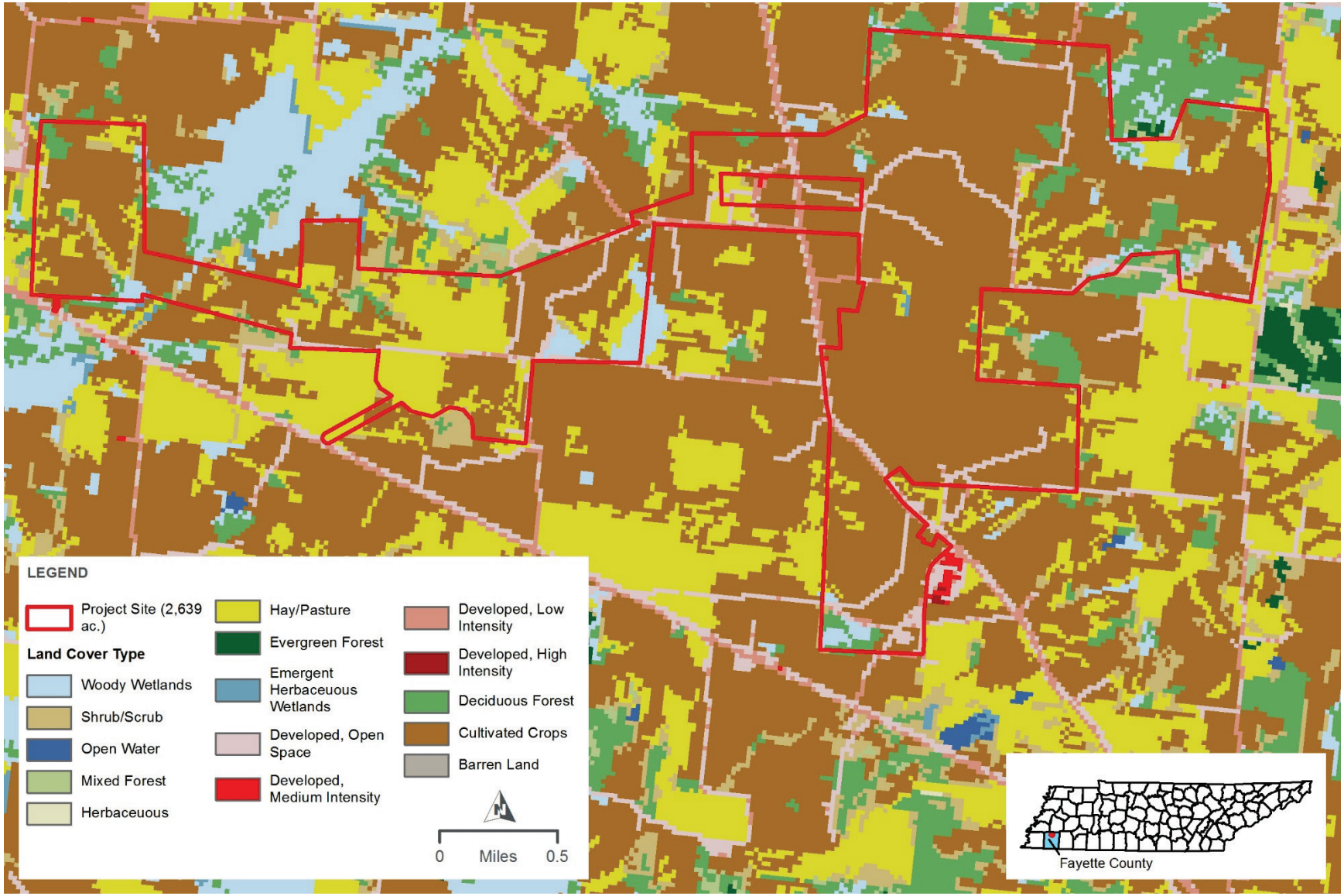

Figure 3-1. Land cover in the Project Area.

3.1.2 Environmental Consequences

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 would not be constructed; therefore, no Project-related impacts to land use would result. Existing land uses would be expected to remain a mix of agricultural and undeveloped land.

3.1.2.2 Proposed Action Alternative

Under the Proposed Action, the construction and operation of the solar facility would change the land use of the 1,624-acre limits of disturbance within the Project Site from agricultural to solar. Because the Project Site is rural with no zoning restrictions and solar power is considered to be a special exception land use type in the Project Area, the development of the Project Site as a solar facility is compatible with current land use regulations. Existing industrial land uses are within the Project Area, approximately 2 miles to the southeast of the Project Site. The addition of the solar facility would result in an expansion of industrial land use to the northwest, where agricultural and rural residential uses currently dominate. Following decommissioning of the proposed Yum Yum Solar Energy Center, a large portion of the Project Site could return to agricultural use or could be used for residential or other development depending on any zoning ordinances in effect at that time.

Since the Project is proposed to be located on primarily agricultural land and there are no outdoor recreation areas in the vicinity, development of the Project would have no impact on public recreation activities or facilities. The activities associated with the Project would not have any indirect effects on land use.

3.2 GEOLOGY, SOILS, AND PRIME FARMLAND

This section describes the existing geological resources in the Project Area and the potential impacts on these geological resources that would be associated with the No Action and Proposed Action Alternatives. Components of geological resources that are analyzed include geology, paleontology, geological hazards, soils, and prime farmland.

3.2.1 Affected Environment

3.2.1.1 Geology

The Project Area is located in the Coastal Plain physiographic province of the Atlantic Plain division (NPS 2017; USGS 2018). In the contiguous U.S., the Coastal Plain extends between coastal Texas and Cape Cod, Massachusetts, spanning approximately 2,200 miles. The Coastal Plain does not extend far inland except surrounding the Mississippi River, where the Coastal Plain stretches into southwestern Kentucky and southeastern Missouri. The Project is in the East Gulf Coastal Plain section and dates to the Tertiary Period (LandScope America 2019; NPS 2019). The landscape of the East Gulf Coastal Plain varies greatly in topography from rolling hills near

the Appalachian Mountains to the flat sandy coastal regions near the Gulf of Mexico and generally slopes seaward in a series of terraces.

3.2.1.2 Paleontology

Western Tennessee was a shallow, tropical sea during the Cenozoic era. Significant paleontological resources are present in Middle and Eastern Tennessee regions near Nashville. Fayette County is not typically associated with paleontological resources (Paleontology Portal 2019), and thus, it is unlikely that fossil remains are present in the Project Area or on the Project Site.

3.2.1.3 Geological Hazards

Geological hazards can include landslides, volcanoes, earthquakes/seismic activity, and subsidence/sinkholes. Conditions do not exist on the Project Site for a majority of these types of hazards. The Project Area is located on relatively stable ground, and no significant slopes are present within several miles; therefore, landslides are not a potential risk. No volcanoes are present within several hundred miles of the Project Site. The predominant geologic unit in Fayette County is Quaternary-aged loess. The Project Site lacks the carbonate bedrock geology and karst landforms associated with sinkholes.

Seismic activity at the site could cause surface faulting, ground motion, ground deformation, and conditions including liquefaction and subsidence. The Modified Mercalli Scale is used within the United States 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 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 USGS Earthquake Hazards Program publishes seismic hazard map data layers that display the PGA with ten percent (one in 500-year event) probability of exceedance in 50 years. The potential ground motion for the Project Area is 0.45g, for a PGA with a two percent probability of exceedance within 50 years (Figure 3-2; USGS 2014).

3.2.1.4 Soils

The Project Site contains 43 soil types. The majority of the soils on the Project Site are composed of Grenada silt loam (40.3%), Falaya silt loam (15.9%), Henry silt loam (15.1%), and Calloway silt loam (10.1%) with other types of soil consisting of less than ten percent each (Figure 3-3 and Table 3-1). Five of the 15 Grenada silt loam types, both of the Falaya silt loam types, one Henry silt loam type, and all six of the Calloway silt loam types are classified as prime farmland soils (USDA 2019a). These soil types are described in Section 3.2.1.5.

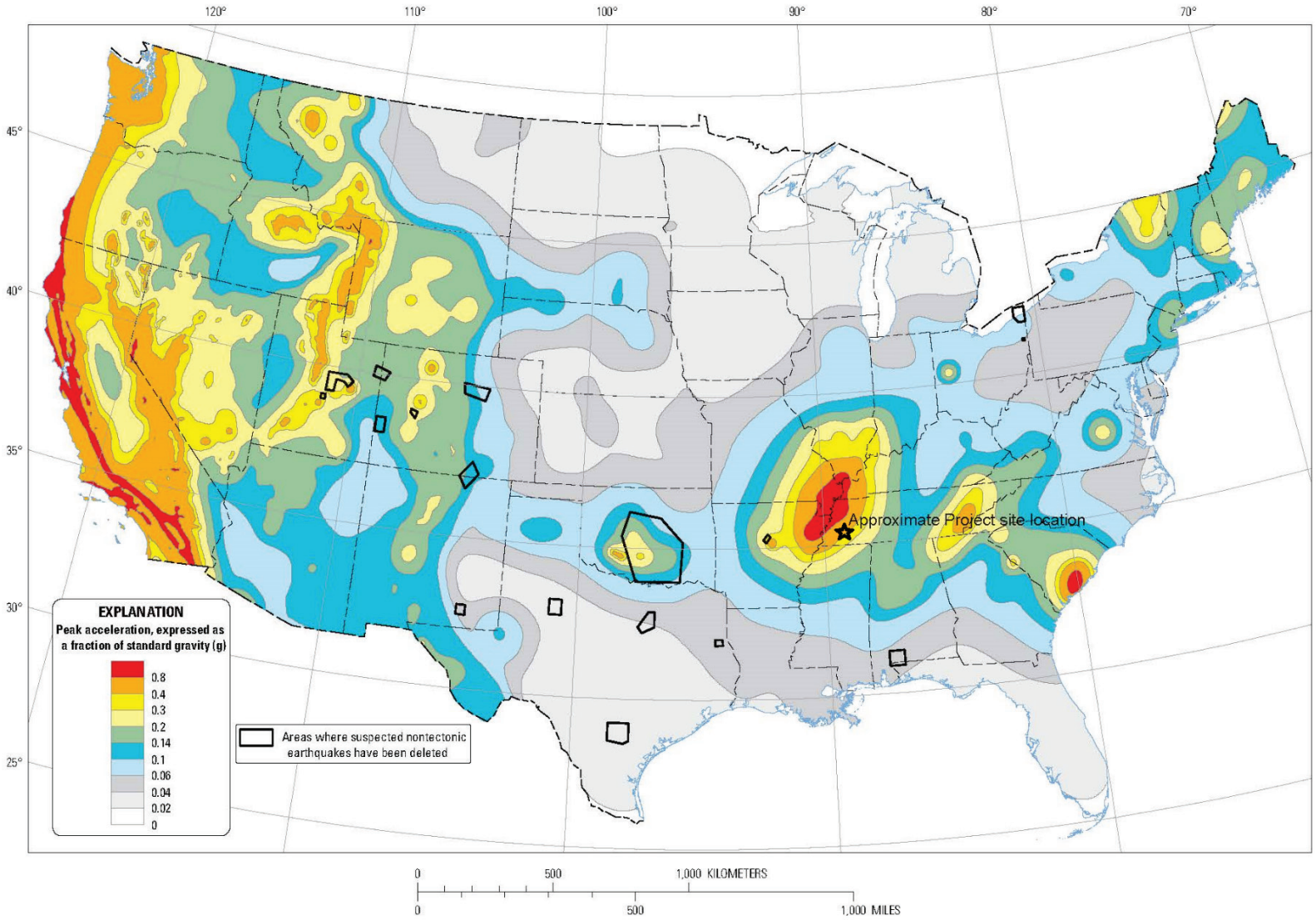

Figure 3-2. Closest seismic hazard areas to the Project Site (USGS 2014).

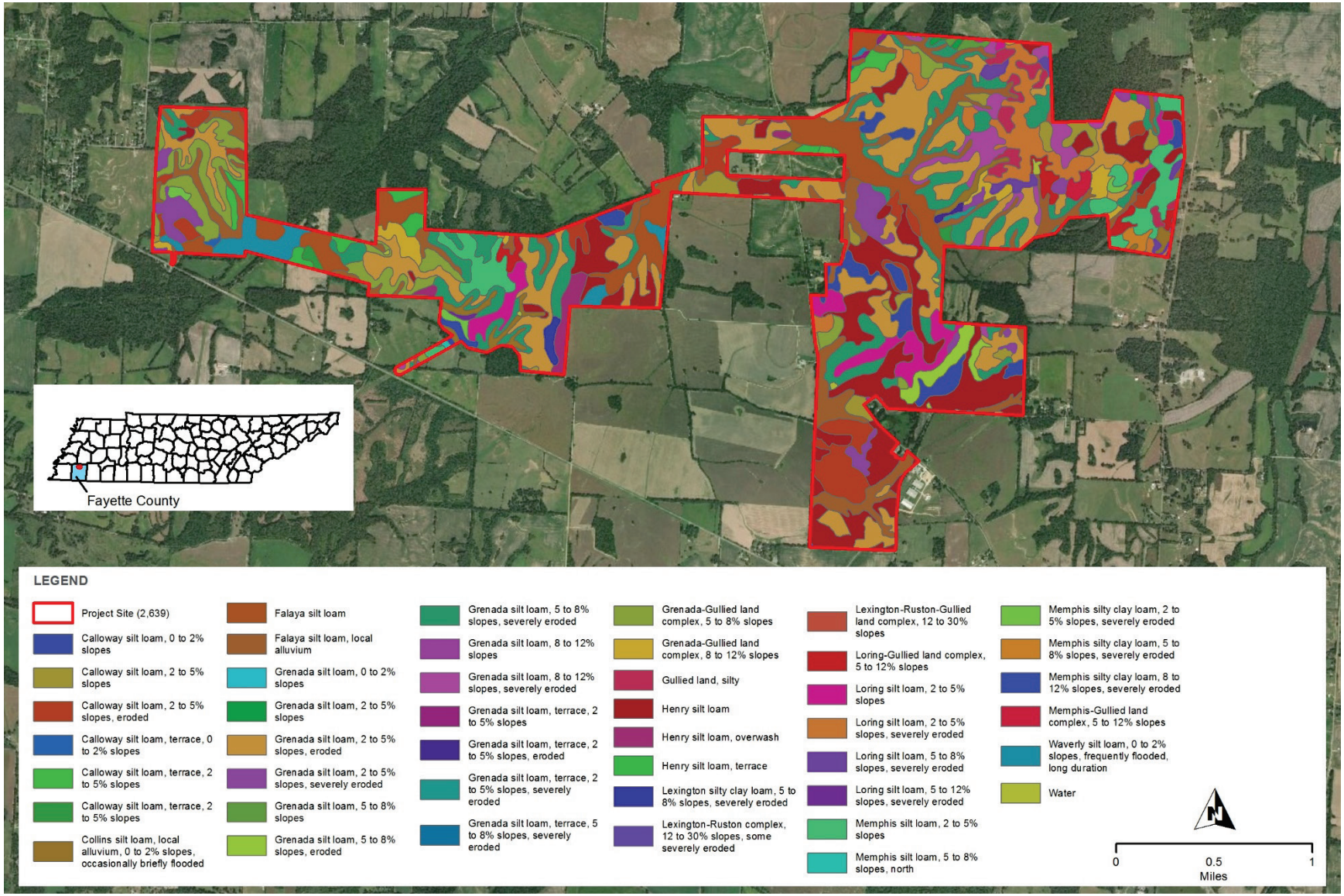

Figure 3-3. Soils on the Project Site.

The Grenada series soils consist of moderately well drained soils that formed in thick loess (USDA 2019a). These soils are shallow to moderately deep to a fragipan (10 – 20 inches) that perches water during wet seasons in late winter and early in spring. Permeability is moderate above the fragipan and slow in the fragipan. These nearly level to strongly sloping soils are in the Southern Mississippi Valley Silty Uplands; slopes range from zero to 12 percent. Henry series soils formed in loess more than four feet thick in depressions and nearly level on uplands and terraces. These soils are moderate deep to a fragipan (16 – 24 inches) and are poorly drained with slow permeability. Henry series soils are usually found in depressions, broad drainageways, or on nearly level areas. The Falaya soil series formed in silty alluvium from loess and are found in the flood plains of the Southern Mississippi Valley silty uplands. These soils are very deep to a fragipan (greater than 80 inches) and are somewhat poorly drained with moderate permeability. The Calloway soil series are formed in thick loess or water reworked loess deposits and are found on nearly level to gently sloping uplands and stream terraces in the Southern Mississippi Valley silty uplands. These soils are shallow to moderately deep to a fragipan (15 – 30 inches) and are somewhat poorly drained with slow permeability within the fragipan.

3.2.1.5 Prime Farmland

Prime farmland is land that is the most suitable for economically producing sustained high yields of food, feed, fiber, forage, and oilseed crops. Prime farmlands have the best combination of soil type, growing season, and moisture supply and are available for agricultural use (i.e., not water or urban built-up land). The Farmland Protection Policy Act ([FPPA]; 7 United States Code [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 FPPA is "to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses." Table 3-1 describes the soil types, including those classified as prime farmland, located on the Project Site. Hydric rating is an indicator of the percentage of a map unit that meets the criteria for hydric soils (USDA 2019b). Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Three soils on the Project Site have hydric ratings: Henry silt loam; Henry silt loam, terrace; and Waverly silt loam, 0 to 2 percent slopes, frequently flooded, long duration. All other soils on the Project Site have a hydric rating of 0.

Table 3-1. Soils on the Project Site.

Soil type	Farmland classification	Area (acres)	Percentage of Project Site
Calloway silt loam, 0 to 2 percent slopes (CaA)	All areas are prime farmland	66.6	2.5
Calloway silt loam, 2 to 5 percent slopes (CaB)	All areas are prime farmland	54.5	2.1
Calloway silt loam, 2 to 5 percent slopes, eroded (CaB2)	All areas are prime farmland	118.7	4.5

Soil type	Farmland classification	Area (acres)	Percentage of Project Site
Calloway silt loam, terrace, 0 to 2 percent slopes (CbA)	All areas are prime farmland	1.7	0.1
Calloway silt loam, terrace, 2 to 5 percent slopes (CbB)	All areas are prime farmland	16.5	0.6
Calloway silt loam, terrace, 2 to 5 percent slopes (CbB2)	All areas are prime farmland	6.7	0.3
Collins silt loam, local alluvium, 0 to 2 percent slopes, occasionally flooded, brief duration (Cu)	All areas are prime farmland	37.4	1.4
Falaya silt loam (Fm)	All areas are prime farmland	184.9	7.0
Falaya silt loam, local alluvium (Fu)	All areas are prime farmland	233.8	8.9
Grenada silt loam, 0 to 2 percent slopes (GaA)	All areas are prime farmland	0.2	0.0
Grenada silt loam, 2 to 5 percent slopes (GaB)	All areas are prime farmland	3.8	0.1
Grenada silt loam, 2 to 5 percent slopes, eroded (GaB2)	All areas are prime farmland	466.9	17.7
Grenada silt loam, 2 to 5 percent slopes, severely eroded (GaB3)	Not prime farmland	64.3	2.4
Grenada silt loam, 5 to 8 percent slopes (GaC)	Not prime farmland	4.9	0.2
Grenada silt loam, 5 to 8 percent slopes, eroded (GaC2)	Not prime farmland	26.8	1.0
Grenada silt loam, 5 to 8 percent slopes, severely eroded (GaC3)	Not prime farmland	276.0	10.5
Grenada silt loam, 8 to 12 percent slopes (GaD)	Not prime farmland	5.1	0.2
Grenada silt loam, 8 to 12 percent slopes, severely eroded (GaD3)	Not prime farmland	58.5	2.2
Grenada silt loam, terrace, 2 to 5 percent slopes (GbB)	All areas are prime farmland	2.5	0.1

Soil type	Farmland classification	Area (acres)	Percentage of Project Site
Grenada silt loam, terrace, 2 to 5 percent slopes, eroded (GbB2)	All areas are prime farmland	3.2	0.1
Grenada silt loam, terrace, 2 to 5 percent slopes, severely eroded (GbB3)	Not prime farmland	2.6	0.1
Grenada silt loam, terrace, 5 to 8 percent slopes, severely eroded (GbC3)	Not prime farmland	0.4	0.0
Grenada-Gullied land complex, 5 to 8 percent slopes (GgC)	Not prime farmland	116.4	4.4
Grenada-Gullied land complex, 8 to 12 percent slopes (GgD)	Not prime farmland	36.4	1.4
Gullied land, silty (Gs)	Not prime farmland	34.1	1.3
Henry silt loam (He)	Not prime farmland	342.3	13.0
Henry silt loam, overwash (Ho)	All areas are prime farmland	26.7	1.0
Henry silt loam, terrace (Ht)	Not prime farmland	29.1	1.1
Lexington silty clay loam, 5 to 8 percent sloping severely eroded (LcC3)	Not prime farmland	7.8	0.3
Lexington-Ruston complex, 12 to 30 percent slopes, severely eroded (lexington-smithdale) (LeF3)	Not prime farmland	2.4	0.1
Lexington-Ruston-Gullied land complex, 12 to 30 percent slopes (lexington-smithdale-gullied land) (LfF)	Not prime farmland	1.7	0.1
Loring-Gullied land complex, 5 to 12 percent slopes (LgD)	Not prime farmland	27.6	1.0
Loring silt loam, 2 to 5 percent slopes (LoB)	All areas are prime farmland	85.7	3.2
Loring silt loam, 2 to 5 percent slopes, severely eroded (LoB3)	All areas are prime farmland	88.3	3.3
Loring silt loam, 5 to 8 percent slopes, severely eroded (LoC3)	Not prime farmland	17.7	0.7

Soil type	Farmland classification	Area (acres)	Percentage of Project Site
Loring silt loam, 5 to 12 percent slopes, severely eroded (LoD3)	Not prime farmland	2.4	0.1
Memphis silt loam, 2 to 5 percent slopes (MeB)	All areas are prime farmland	91.1	3.5
Memphis silt loam, 5 to 8 percent slopes, north (MeC)	Not prime farmland	0.9	0.0
Memphis silty clay loam, 2 to 5 percent slopes, severely eroded (MfB3)	All areas are prime farmland	10.1	0.4
Memphis silty clay loam, 5 to 8 percent slopes, severely eroded (MfC3)	All areas are prime farmland	12.0	0.5
Memphis silty clay loam, 8 to 12 percent slopes, severely eroded (MfD3)	Not prime farmland	6.2	0.2
Memphis-Gullied land complex, 5 to 12 percent slopes (MgD)	Not prime farmland	8.5	0.3
Water (W)	Not prime farmland	4.8	0.2
Waverly silt loam, 0 to 2 percent slopes, frequently flooded, long duration (Wv)	Not prime farmland	50.5	1.9
Total Prime Farmland		1,511.3	57.3

***Source*:** USDA 2019a

The locations of prime farmland soils on the Project Site are shown on Figure 3-4. Based on information from USDA (2019a), prime farmland soils occur on approximately 1,511 acres, constituting approximately 57 percent of the 2,639-acre Project Site. Table 3-2 provides farm information in Fayette County and overall in the State of Tennessee for comparison.

Table 3-2. Farming statistics for Fayette County, Tennessee.

	Number of farms	Percentage of total area in farms	Land in farms (acres)	Average size of farms (acres)
Fayette County	745	50.7	229,022	307
Tennessee	68,050	41.2	10,867,812	160

Source: USDA 2012

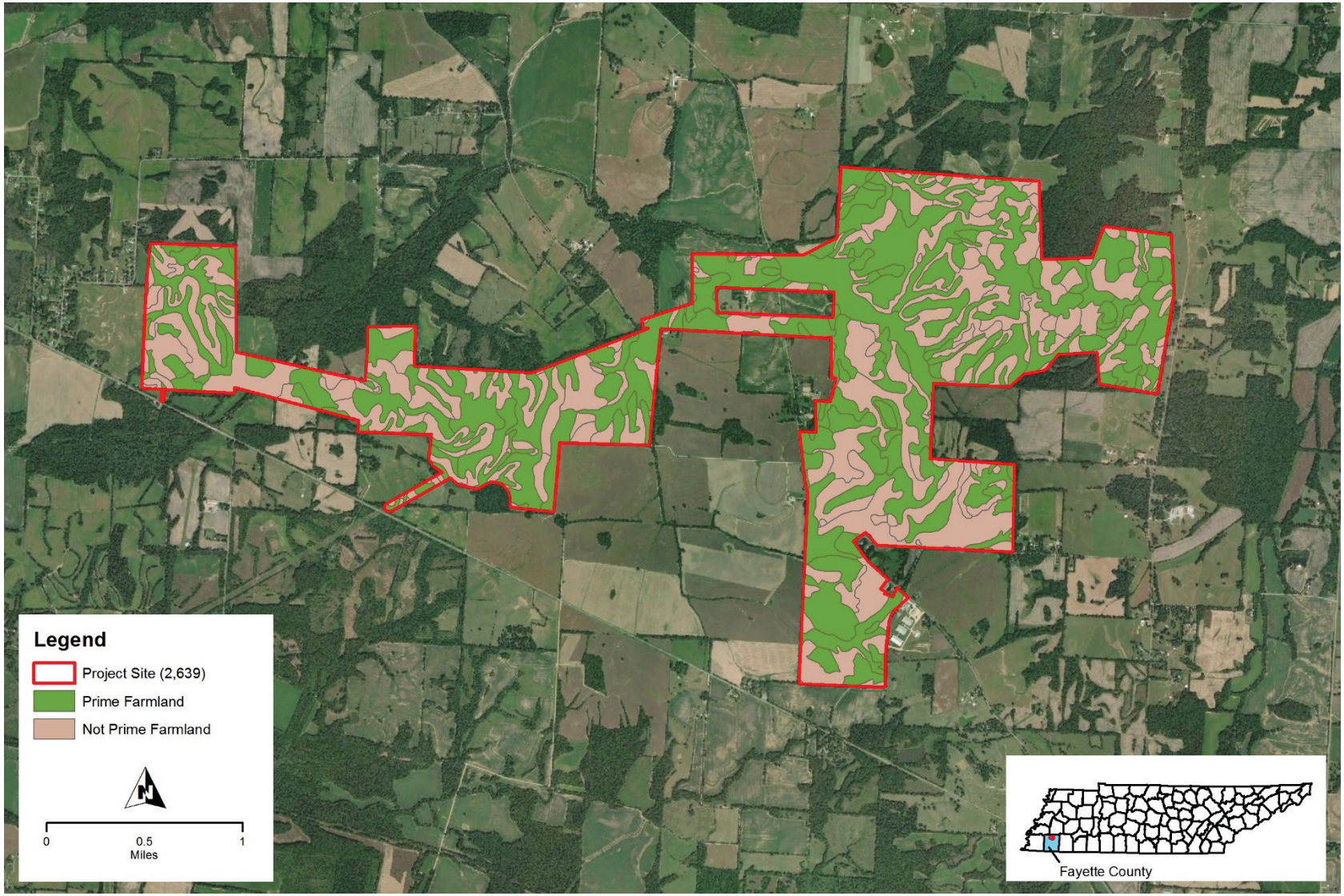

Figure 3-4. Soils classified as prime farmland on the Project Site.

3.2.2 Environmental Consequences

This section describes the potential impacts to geologic resources and prime farmlands 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 would not be constructed; therefore, no direct or indirect Project related impacts on geological, paleontological, soil resources, or prime farmlands would result. Existing land use on the Project Site would be expected to remain a mix of agricultural and undeveloped land.

Over time, impacts to soils and geology could occur if the current land use practices are changed. If the Project Site were to be developed, changes to the soils on site would occur. Conversely, if agricultural practices were continued and proper conservation practices are not followed, such as terracing or application of soil amendments, soils could eventually become depleted in nutrients or erode, resulting in minor changes on the Project Site.

3.2.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to geology and soil resources would occur as a result of construction and operation of the Project. Approximately 62 percent (1,624 acres) of the 2,639-acre Project Site would be cleared and/or graded for the solar facility, with the exception of biologically sensitive areas such as those associated with jurisdictional streams and wetlands. Grading and clearing for the solar facility would cause minor, localized increases in erosion and sedimentation, resulting in minor impacts to geology and soils.

Geology and Paleontology

Under the Proposed Action, minor impacts to geology 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 seven to 15 feet. If needed, on-site sedimentation basins would be shallow and, to the extent feasible, utilize the existing terrain without requiring extensive excavation. The PV panels would be connected with underground wiring placed in trenches about 3 feet deep. Minor excavations would also be required for construction of the Project substation, installation of each medium voltage transformer and for construction of TVA's proposed Yum Yum 161-kV Switching Station. Due to the small sizes of the subsurface disturbances, only minor direct impacts to potential subsurface geological resources are anticipated.

As excavation would be limited, only minor direct impacts to geological resources would be anticipated. Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, to recover these resources, to analyze the potential for additional impacts, and to develop and implement 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; however, there is moderate potential for small to moderate intensity seismic activity. The solar facility would be designed to comply with applicable seismic standards. Either seismic activity or sinkholes would likely only cause minor impacts to the Project Site and equipment on the site. Geologic hazard impacts on the site would be unlikely to impact off-site resources.

Soils

As part of the site preparation and development process, approximately 1,624 acres of the Project Site would be developed. The Project Site soils could be temporarily affected due to construction activities and mowing during operation. Any stockpiled soils from the area where vegetation clearing and grading may occur would be replaced following cut-and-fill activities to the extent practical and, therefore, likely not require any off-site or on-site hauling of soils. However, some minimal off-site or on-site hauling may be necessary.

The Project was designed to minimize impacts to on-site streams and wetlands. Although not anticipated, should borrow material be required, small amounts of sand and gravel aggregate may be obtained either from on-site activities within the 1,624-acre disturbed portion of the Project Site, or from local, off-site sources. The creation of new impervious surface, in the form of footings for pole structures and the foundations for the central inverters and the Project substation, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Planting of native and/or noninvasive vegetation within the limits of disturbance along with 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 over 1 acre, a NPDES Permit for discharges of stormwater associated with construction activities would be required. Application for the permit would require submission of a SWPPP describing the management practices that would be utilized during construction to prevent erosion and runoff and those that would be used 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 operation.

During operation of the solar facility, very minor disturbance could occur to soils. Routine maintenance would include periodic motor replacement, inverter air filter replacement, fence repair, vegetation control, and periodic array inspection, repairs, and maintenance. The Project would implement mechanized landscaping using lawnmowers, weed eaters, etc. Trimming and mowing to maintain the vegetation at a height of approximately 18 inches would be performed as needed but is estimated to occur no more than three times per growing season. Selective spot applications of herbicides may be employed around structures to control weeds. Products used would be limited to post-emergent herbicides and would be applied by a professional contractor or a qualified Project technician. These maintenance activities would not result in any adverse impacts to soils on the Project Site during operation.

Prime Farmland

Should the Proposed Action be implemented, approximately 62 percent (1,624 acres) of the 2,639-acre Project Site would be developed into the Yum Yum Solar Energy Center and associated interconnection infrastructure and removed from potential farm use. This would include approximately 929 acres of prime farmland or approximately 62 percent of the total prime farmland soils at the Project Site.

The construction and operation of the solar facility would remove approximately 929 acres of prime farmland from potential agricultural use and would result in conversion of the entire 1,624-acre area proposed for development from agricultural land to a developed solar power facility. The remaining 1,015 acres, or approximately 38 percent of the Project Site, would remain undisturbed by the Project. Appropriate erosion control measures would be used to control erosion and limit sediment/soil from leaving the Project Site. During grading, topsoil would be removed and stockpiled and, as grading is nearing completion, redistributed over the graded areas. None of the soils on the Project Site have characteristics that would require special construction techniques or other nonroutine measures. Upon decommissioning, once the facility components are removed and the site is stabilized, farming could resume with little long-term loss of soil fertility and potential agricultural production.

In accordance with FPPA evaluation procedures, a USDA Farmland Conversion Impact Rating Form (Form AD-1006) was completed for the Project Site by the Project team in order to quantify the potential impacts to prime farmland. The impact rating considers the acreage of prime farmland to be converted, the relative abundance of prime farmland in the surrounding county, and other criteria such as distance from urban environments, percentage of area currently being farmed, and compatibility with existing agricultural use. This form assigns a numerical rating between zero and 260 based on the area of prime farmland to be disturbed, the total area of farmland in the affected county, and other criteria. Sites with a total score of at least 160 have the potential to adversely affect prime farmland. Projects with total impact rating scores below the threshold value of 160 do not require further consideration under the FPPA. The impact rating score was 158 points for the Project Site (Appendix F).

Based on the ratings for the Project Site, overall effects on soils, including prime farmland, as a result of the Proposed Action would not be considered significant. Following the eventual decommissioning and removal of the solar facility, the Project Site could be returned to agricultural use.

3.3 WATER RESOURCES

This section describes an overview of existing water resources in the Project Area and the potential impacts on these water resources that would be associated with the No Action and Proposed Action Alternatives. Components of water resources that are analyzed include groundwater, surface water, wetlands, and floodplains.

3.3.1 Affected Environment

3.3.1.1 Groundwater

Groundwater is water located beneath the ground surface, within soils and subsurface formations known as hydrogeological units, or aquifers (USGS 1995). Aquifers have sufficient permeability to conduct groundwater and to allow economically significant quantities of water to be produced by man-made water wells and natural springs. The Upper Claiborne aquifer, part of the Mississippi embayment aquifer system in the Coastal Plain physiographic province, underlies the majority of the Project Site in Fayette County. The Middle Claiborne confining unit, situated between the Upper and Middle Claiborne aquifers, underlies limited, eastern portions of the Project Site. The Mississippi embayment aquifer system underlies portions of Alabama, Arkansas, Florida, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee.

Aquifers in the Coastal Plain physiographic province consist of unconsolidated to semi-consolidated sediments that range from the Upper Cretaceous through the late Eocene epochs (USGS 1995). The geologic units of the Coastal Plain include deposits of Tertiary sedimentary marine rocks. The Upper Claiborne aquifer is the uppermost hydrogeological unit of the Mississippi embayment aquifer system and consists of sediments of Eocene age and varies between sand, silt, and clay. Precipitation falling directly on surface outcrops of the aquifer units provides the primary water recharge for the Upper Claiborne aquifer with a small recharge from upward leaking due to underlying aquifers. Most of this precipitation becomes surface water streams, but some percolates through the soil and drains into cracks and fissures in the bedrock. Groundwater in this aquifer system is not a large source of water for human consumption. The Upper Claiborne aquifer primarily flows in the general direction of the Mississippi River to the southwest along the axis of the Mississippi embayment.

The Middle Claiborne confining unit consists of fine-grained sediments that limit water flow between the Upper and Middle Claiborne aquifers. The clays and silts that comprise this aquifer were derived from the Cook Mountain Formation of the Middle Eocene. The confining unit overlies the Middle Claiborne aquifer, which constitutes a major source of groundwater in the region.

The water quality in the Mississippi embayment aquifer system is generally suitable for most uses and ranges from soft to moderately hard, calcium bicarbonate near the edges with sodium bicarbonate toward the deeper sections of the aquifer (USGS 1995). Iron, fluoride, and sulfate concentrations are low throughout the aquifer system, with mineralization, iron, and hardness increasing westward from the outcrop and recharge area to counties along its western edge, including Dyer, Lake, Lauderdale, Obion, Shelby, and Tipton counties (Parks and Carmichael 1990; USGS 1995). Dissolved solids are usually less than 250 milligrams per liter for most of the Mississippi embayment aquifer, while deeper sections of the aquifer can have dissolved solid levels of over 1,000 milligrams per liter (USGS 1995).

3.3.1.2 Surface Water

Surface water is any water that flows above ground and includes, but is not limited to, streams, ditches, ponds, lakes, and wetlands. Streams are classified as perennial, intermittent, and ephemeral based on the occurrence of surface flow. Wetlands are those areas inundated by

surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples of wetlands include swamps, marshes, bogs, and wet meadows.

Surface waters with certain physical and hydrologic characteristics (defined bed and bank, ordinary high water mark, or specific hydrologic, soil, and vegetation criteria) are considered Waters of the U.S. (or jurisdictional waters) and are under the regulatory jurisdiction of USACE. The CWA is the primary federal statute that governs the discharge of pollutants and fill materials into Waters of the U.S. under Sections 402, 404 and 401. The limits of Waters of the U.S. are defined through a jurisdictional determination accepted by USACE. State agencies have jurisdiction over water quality.

The Project Site is located in the Laurel Creek Canal Subwatershed (12-digit Hydrologic Unit Code [HUC] 08010209030401), Big Creek Watershed (HUC-10 0801020904), in the Loosahatchie Watershed (HUC-8 08010209; USGS 2019c). The Loosahatchie Watershed is part of the Mississippi River Basin and is located in Western Tennessee in portions of Fayette, Hardeman, Haywood, Shelby, and Tipton counties. The Loosahatchie Watershed has approximately 1,436 miles of streams and 81 reservoir and lake areas and drains approximately 741 square miles to the Loosahatchie River, which drains to the Mississippi River.

The Project Area drains to several unnamed tributaries of the Laurel Creek Canal. The Laurel Creek Canal drains southeast from the Project Area to its confluence with the Loosahatchie River approximately six miles southeast of the Project Site. The Laurel Creek Canal is classified by the state for fish and aquatic life, recreation, livestock watering and wildlife, and irrigation (TDEC 2013). USEPA has approved a Total Maximum Daily Load (TMDL) for *Escherichia coli* (*E. coli*) in the Loosahatchie River Watershed (USEPA 2011a).

Field surveys of the Project Site were conducted November 11-16, 2018 and January 13-18 and March 12-13, 2019 to determine the presence of potentially jurisdictional wetlands and streams. WWCs regulated by TDEC were also identified. Wetlands on the Project Site were identified in accordance with methodologies described in the 1987 *Corps of Engineers Wetlands Delineation Manual* (1987 Manual) (USACE 1987) and the Atlantic and Gulf Coastal Plain regional supplement to the 1987 Manual (USACE 2010). Streams and WWC features were classified utilizing the methodology and guidance provided in Regulatory Guidance Letter (RGL) 05-05 and the TDEC Division of Water Pollution Control *Guidance For Making Hydrologic Determinations* (TDEC 2011). The on-site water resources identified during the field survey were submitted to USACE and TDEC for confirmation of their jurisdictional status in June 2019 (Appendix F). A total of 25 wetlands (76.6 acres), 11 manmade ponds typically for agricultural use (7.0 acres), 16 perennial streams (31,357 linear feet), 34 intermittent streams (24,885 linear feet), and 94 WWCs (54,174 linear feet) were identified within the 2,639-acre Project Site. Surface water locations are shown in Figure 3-5 and Figure 3-6 and listed in Table 3-3. In the submittals to TDEC and USACE, it was recommended that the WWCs do not meet jurisdictional wetland criteria or the definition for classification as a jurisdictional stream.

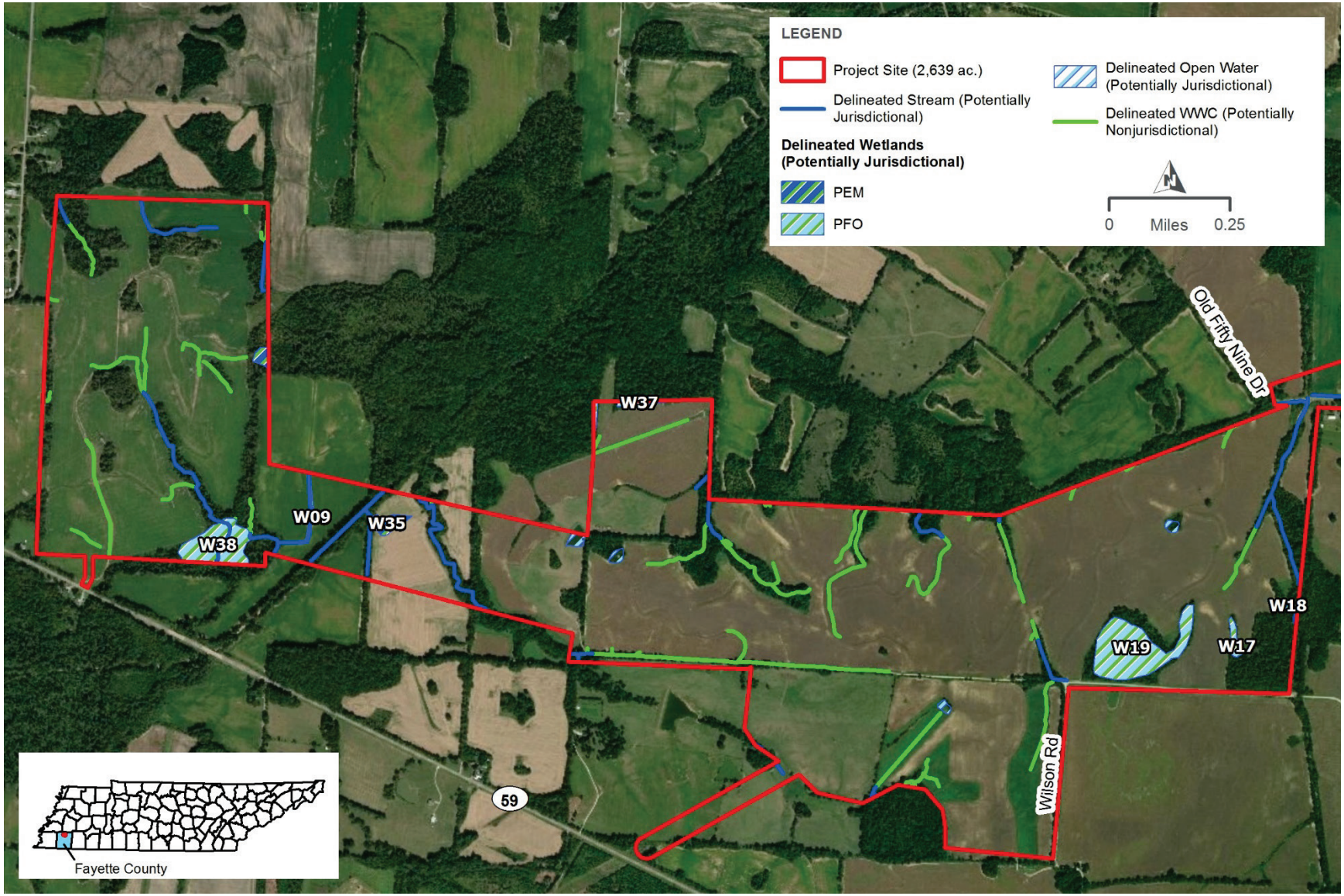

Figure 3-5 West. Aerial photograph showing wetlands, streams, and WWCs on the Project Site.

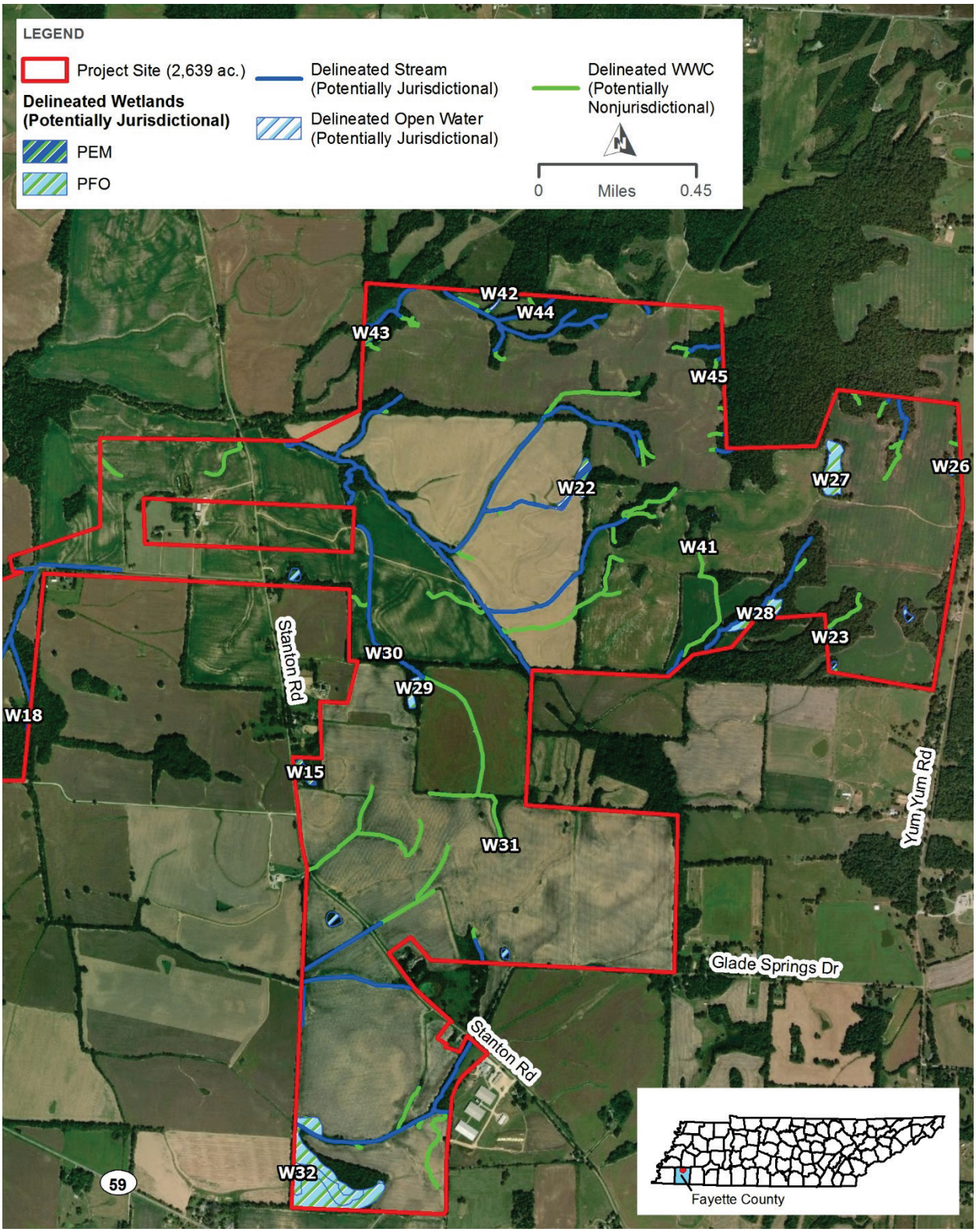

Figure 3-5 East. Aerial photograph showing wetlands, streams, and WWCs on the Project Site.

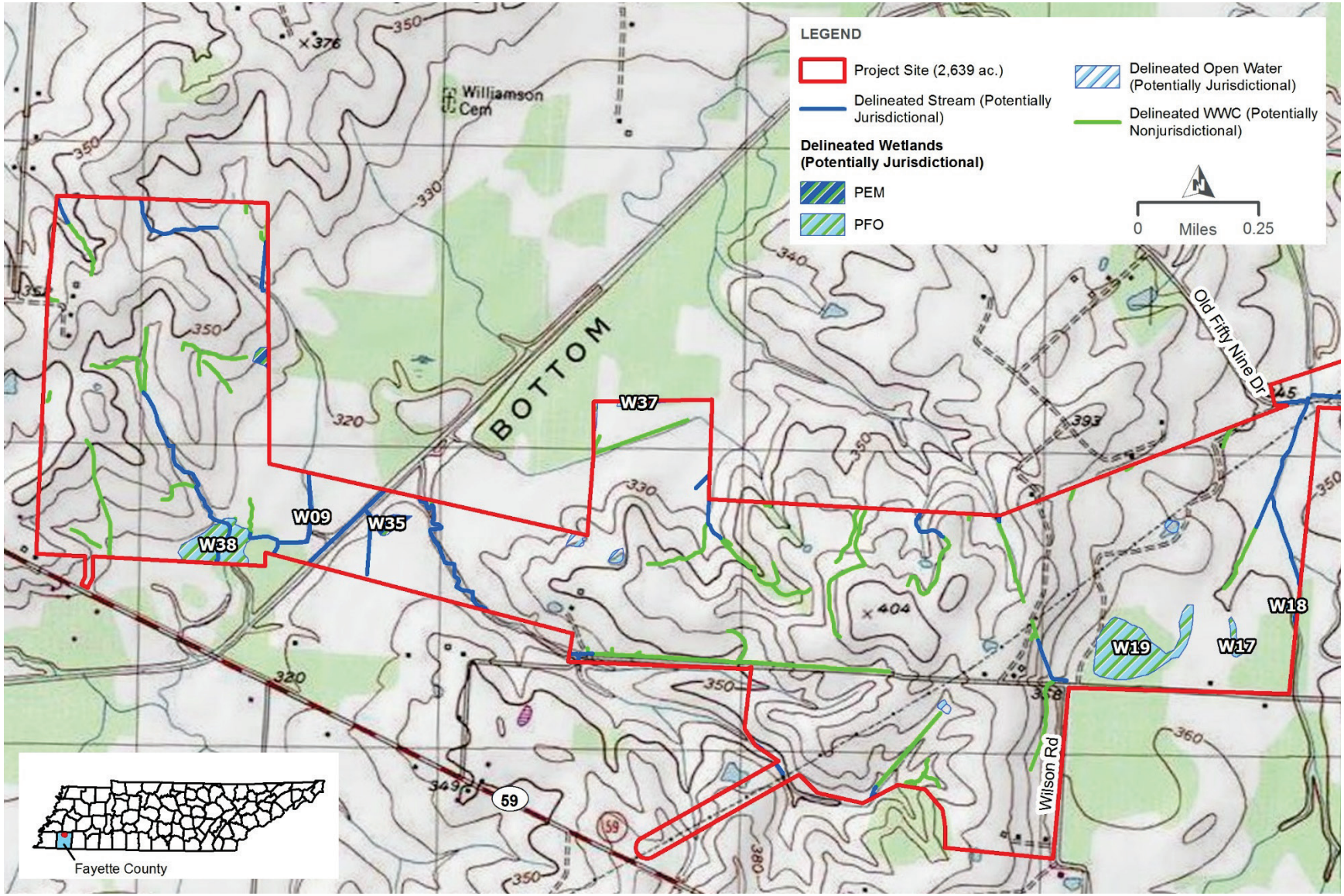

Figure 3-6 West. Topographic quadrangles showing wetlands, streams, and WWCs on the Project Site.

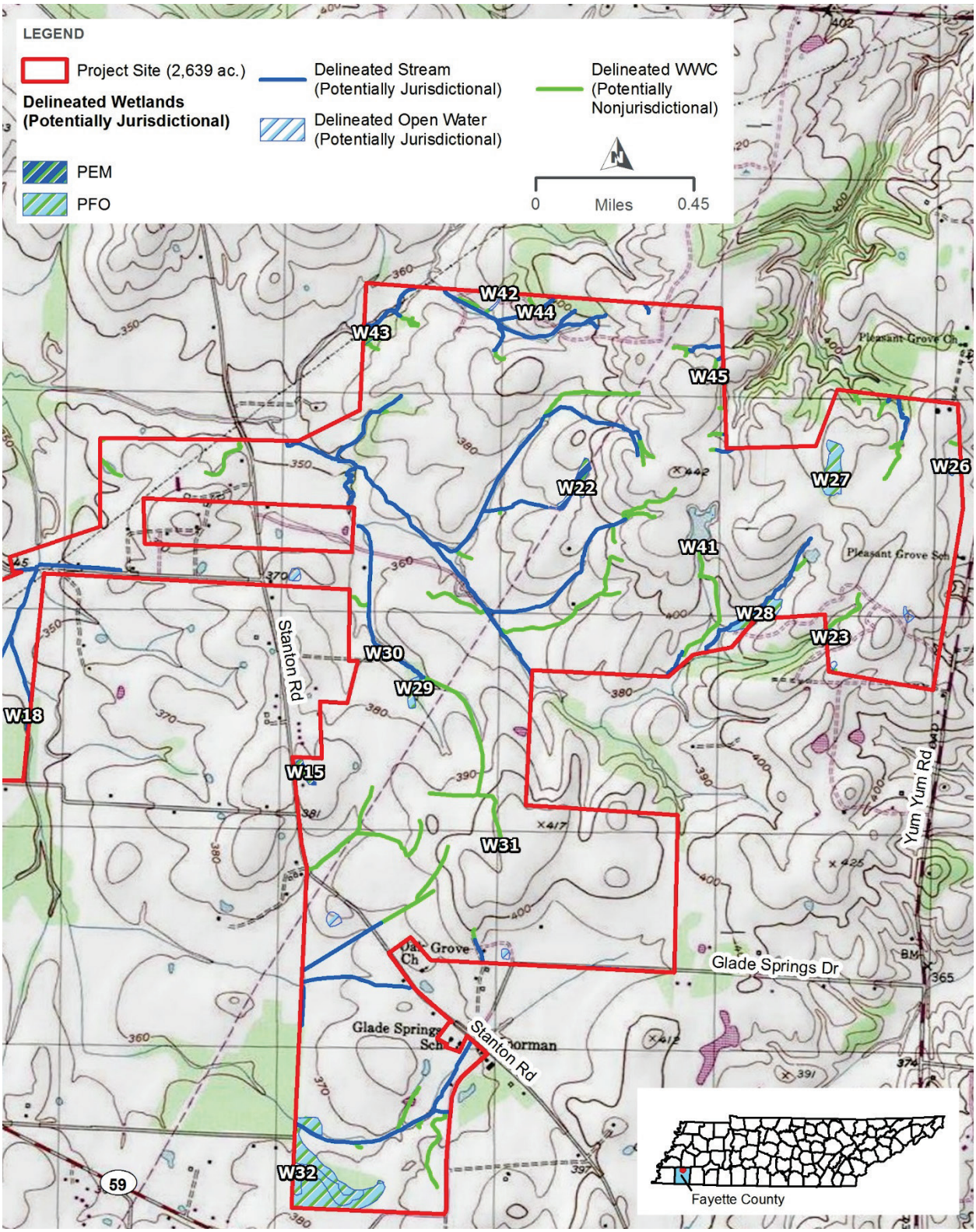

Figure 3-6 East. Topographic quadrangles showing wetlands, streams, and WWCs on the Project Site.

Wetlands on the Project Site were classified by hydrologic regime and vegetation cover type in accordance with the Cowardin Classification System (Cowardin et. al. 1979). Two wetland types were identified on site: palustrine emergent (PEM; 6.8 acres) and palustrine forested (PFO; 69.8 acres) wetlands, for a total of 76.6 acres of potentially jurisdictional wetlands. PEM wetlands were typically found in agricultural settings and were highly disturbed by agricultural activities resulting in vegetation dominated by emergent vegetation, such as Pennsylvania smartweed (*Polygonum pensylvanicum*), and nonnative species, such as reed canary grass (*Phalaris arundinacea*). PFO wetlands were typically dominated by various hardwood tree species such as American sycamore (*Platanus occidentalis*), American sweetgum (*Liquidambar styraciflua*), and swamp white oak (*Quercus bicolor*).

Additionally, wetlands were evaluated by their functions using a TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA power service area (TVA Rapid Assessment Method or "TVARAM"). This assessment is designed to determine the ecological quality and the level of function of a particular wetland and to define wetlands into three categories of wetland function and integrity: Category 1, Category 2, and Category 3. Wetlands were placed into functional categories based on a numeric score ranging from zero to 100 determined by a qualitative measure of ecosystem functions.

- Category 1 (Scores 0-34.9) wetlands are low quality, degraded aquatic resources that may exhibit low species diversity, minimal hydrologic input and connectivity, recent or on-going disturbance regimes, and/or predominance of nonnative species. These wetlands provide low functionality and are considered of low value.
- Category 2 (Scores 35-64.9) represents moderate quality wetlands that provide functions at a greater value due to a lesser degree of degradation and/or due to their habitat, landscape position, or hydrologic input. Moderate quality wetlands are considered healthy water resources of value. Disturbance to hydrology, substrate, and/or vegetation may be present to a degree at which valuable functional capacity is sustained, and there is reasonable potential for restoration.
- Category 3 (Scores 65-100) wetlands are superior quality wetlands, which may exhibit little, if any, recent disturbance; provide essential and/or large scale stormwater storage, sediment retention, and toxin absorption; contain mature vegetation communities; and/or offer habitat to rare species. Superior quality wetlands include those wetlands offering high functions and values within a watershed or are of regional and/or statewide concern. Conditions found in superior quality wetlands often represent restoration goals for wetlands functioning at a lower capacity.

All of the wetlands identified on the Project Site scored within the range of Category 1 wetlands. Table 3-3 presents the classification and functional score for each wetland area identified on site.

Table 3-3. Wetlands on the Project Site.

Wetland Identifier	Type[1]	TVARAM Existing Functional Capacity[2]	TVARAM Score	Acres
W09	PEM	Category 1	17	1.4
W15	PEM/FO	Category 1	15	1.1

Wetland Identifier	Type[1]	TVARAM Existing Functional Capacity[2]	TVARAM Score	Acres
W17	PFO	Category 1	16	0.8
W18	PEM	Category 1	19	0.1
W19	PFO	Category 1	26	10.3
W22	PEM	Category 1	17	2.6
W23	PFO	Category 1	26	0.7
W26	PFO	Category 1	17	0.4
W27	PFO	Category 1	21	4.3
W28	PFO	Category 1	22	3.6
W29	PFO	Category 1	18	1.2
W30	PFO	Category 1	19	0.1
W31	PEM	Category 1	14	0.1
W32	PFO	Category 1	18	34.8
W35	PEM	Category 1	16	1.3
W37	PFO	Category 1	17	3.6
W38	PFO	Category 1	18	8.2
W41	PFO	Category 1	14	0.1
W42	PFO	Category 1	16	0.3
W43	PFO	Category 1	17	1.4
W44	PFO	Category 1	19	0.1
W45	PEM	Category 1	16	0.1
Total Acres				**76.6**

1 Classification codes as defined in Cowardin et al. (1979)

2 TVARAM categories from Mack (2001)

PEM = Palustrine emergent; PFO = Palustrine forested.

3.3.1.3 Floodplains

The Federal Emergency Management Agency (FEMA) produces maps that show the likelihood of flooding in an area. These maps are used to determine eligibility for the National Flood Insurance Program (NFIP). The NFIP intends to reduce the impact of flooding on private and public structures by encouraging communities to adopt and enforce floodplain management regulations to help mitigate the effects of flooding on buildings. E.O. 11988, Floodplain Management, requires federal agencies 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."

One FEMA-designated floodplain associated with the Laurel Creek Canal (Fayette County, Tennessee, Flood Insurance Rate Map [FIRM] Panels 47047C0185C, 47047C0195C and 47047C0180C, all with an effective date of November 5, 2008), is located on the Project Site (FEMA 2017). The floodplain is designated as Zone A, areas with a 1 percent annual chance of a flood event and no base flood elevations or flood depths have been determined, and is located in the extreme western portion of the Project Site, as shown in Figure 3-7.

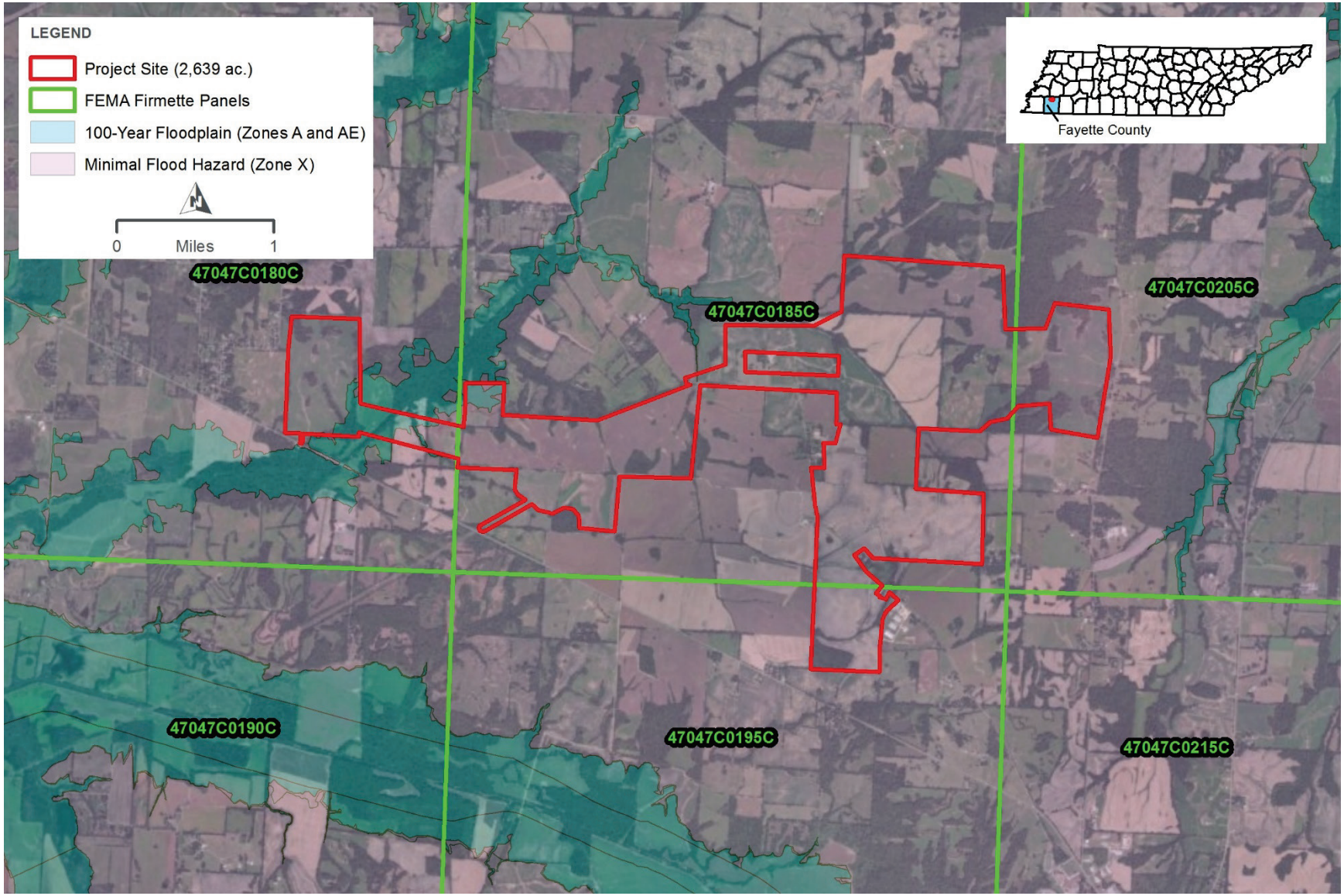

Figure 3-7. Floodplains in the Project Area.

3.3.2 Environmental Consequences

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

3.3.2.1 No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed; therefore, no direct Project related impacts to water resources would be expected to occur. Existing land use would remain a mix of agricultural and undeveloped land, and water resources would remain as they are at the present time. Indirect impacts to water resources could occur due to continuing agricultural use of the Project Site. Increases in erosion and sediment runoff could occur if farming practices were not maintained using BMPs. Erosion and sedimentation on site could alter runoff patterns on the Project Site and impact downstream surface water quality. In addition, if the local aquifers are recharged from surface water runoff, the use of chemical fertilizers and pesticides could impact both the surface water and groundwater.

3.3.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to streams (i.e. culvert crossings for access roads) would be anticipated as a result of construction and operation of the Project. No impacts to wetlands and minor impacts to floodplains are anticipated. Beneficial, indirect impacts to groundwater and surface water could result from the change in land use, including a reduction in fertilizer and pesticide runoff, the improvement of water quality by filtering through native and/or noninvasive vegetation, and the reduced likelihood of erosion and sedimentation.

Groundwater

No direct adverse impacts to groundwater would be anticipated as a result of the Proposed Action. The PV panels would have a relatively minor effect on groundwater infiltration and surface water runoff because the panels would not include a runoff collection system. Rainwater would drain off the panels to the adjacent vegetated ground. Hazardous materials that could potentially contaminate groundwater would be stored on the Project Site during construction. The minimal use of petroleum fuels, lubricants, and hydraulic fluids during construction and by maintenance vehicles would result in the potential for small on-site spills. However, 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. Project activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. BMPs, such as those described in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2017b), would be used to avoid contamination of groundwater from Project activities. Fertilizers and herbicides would be used sparingly and in accordance with manufacturer's recommendations to avoid contamination of groundwater. Additionally, beneficial indirect impacts to groundwater could result from the change in land use.

Construction-related Water Needs

No water service is currently available at the Project Site. However, water service is anticipated as an on-site need during construction. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads, foundations, equipment pads, and other components, the primary use of water would be for compaction and dust control. Smaller quantities would be required for preparation of the equipment pads and other minor uses. Water used during construction would be provided via a proposed Project well and would not adversely affect groundwater resources.

Operation and Maintenance-related Water Needs

The primary uses of water during operation and maintenance-related activities would be for possible dust control (the proposed PV technology requires no water for the generation of electricity) and bathrooms in the operations and maintenance building. The internal access roads would not be heavily traveled during normal operation and consequently, water use for dust control is not expected. Many of the existing roads are paved and would not result in additional dust. Equipment washing and any potential dust control discharges would be handled in accordance with BMPs described in the SWPPP for water-only cleaning.

The precipitation in the area is adequate to minimize any buildup of dust and other matter on the PV panels that would reduce energy production; therefore, no regular panel washing is anticipated. The panels would be cleaned if a specific issue was identified or depending on the frequency of rainfall, proximity of arrays to sources of airborne particulates, and other factors.

Water needs during operations and maintenance would be provided via the proposed Project well. The well would also be used during construction and would not adversely affect groundwater resources.

Decommissioning and Site Reclamation-related Water and Wastewater Needs

Because conditions can change during the course of the Project, a final Decommissioning and Closure Plan would be created based on site conditions at the time of facility closure.

The Project would comply with the requirements of the NPDES through preparation and implementation of a SWPPP and filing of a Notice of Intent to comply with the General Construction Stormwater NPDES Permit. The plan would include procedures to be followed during decommissioning to prevent erosion and sedimentation, nonstormwater discharges, and contact between stormwater and potentially polluting substances.

Decommissioning and site reclamation would likely 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.

Overall Groundwater Impacts

The proposed Project water well would be sited to avoid contamination of groundwater and to prevent runoff from entering the well. Thus, the proposed Project well would not adversely affect groundwater resources. Bathroom facilities needed during operations and maintenance would be serviced via the proposed Project septic system. The septic system would be permitted by TDEC and would be sited to comply required setbacks and TDEC direction. Thus, the proposed Project septic system would not adversely affect groundwater resources.

Due to the small volume of groundwater anticipated to be needed for the Project, compared to the overall withdrawal rate for the Mississippi embayment aquifer system of approximately 311 mgd (USGS 1995), impacts to the local aquifer and groundwater in general are not anticipated. The use of BMPs and a SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during operation or maintenance. Overall, impacts to groundwater are not anticipated.

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 impacts, resulting in a beneficial, though minor, indirect impact to groundwater.

Surface Water

During the facility design process, impacts to on-site streams, wetlands, and TDEC-regulated WWCs were minimized. Complete avoidance of water features was not feasible, and the construction and operation of the Project would permanently affect up to six streams for road crossings (0.42 acre; 96 linear feet) and 63 WWCs (34,920 linear feet) for installation of solar panels on the Project Site. Additionally, some impacts to WWCs could occur due to road crossings. Impacts to potentially jurisdictional water features are not expected from the installation of buried cables due to the use of boring to install these Project elements.

Any pesticide or herbicide use as part of construction or operation activities would comply with the TDEC General Permit for Application of Pesticides, associated with Permit TNR100000 described in Section 1.4. Proper implementation and application of these products may result in minor impacts to surface water. As described above for groundwater, beneficial indirect impacts to on-site surface water is expected to result from the change in land use.

The siting of the proposed Project septic system would involve consideration of the proposed location of the septic system in relation to nearby water features such as drainageways and streams. Thus, the proposed septic system would not adversely affect surface water.

Streams

Under the Proposed Action, minor, direct adverse impacts to potentially jurisdictional stream channels are expected to occur. The installation of pipe culverts for up to six road crossings would

permanently affect an approximate 16-foot length of each affected stream and would result in approximately 96 linear feet (0.42 acre) of stream impacts. Minor temporary direct adverse impacts during construction are anticipated; however, the use of BMPs would minimize sediment runoff during construction.

These impacts would be subject to the conditions of the Section 404 and TDEC ARAP permits described in Section 1.4 and may require mitigation.

Wetlands

TVA is subject to E.O. 11990, Protection of Wetlands. Under the Proposed Action, no impacts to potentially jurisdictional wetlands are anticipated as the Project Site layout was designed to avoid wetlands. Therefore, the Proposed Action is consistent with the requirements of E.O. 11990.

Cumulative Surface Water Impacts

Potential impacts to surface waters during construction would be minimized through the use of BMPs for controlling soil erosion and runoff, such as the use of 25-foot buffer zones surrounding potentially jurisdictional streams and wetlands and the installation of erosion control silt fences and sediment traps. Therefore, through the use of BMPs and avoidance measures, impacts to surface waters during construction would be minor. The operation and maintenance of the solar facility would have little impact on surface water, and BMPs would be used during any maintenance activities that have the potential to cause runoff of sediment and pollutants.

Due to the minimal impacts to on-site streams and minor runoff impacts expected to surface waters across the Project Site during construction, and the use of BMPs to prevent sedimentation, impacts to on-site jurisdictional waters would be insignificant. As needed, Yum Yum Solar would obtain the Section 404 and TDEC ARAP permits described in Section 1.4. Figure 3-8 depicts the potential impacts to Waters of the U.S. as well as WWCs on the Project Site.

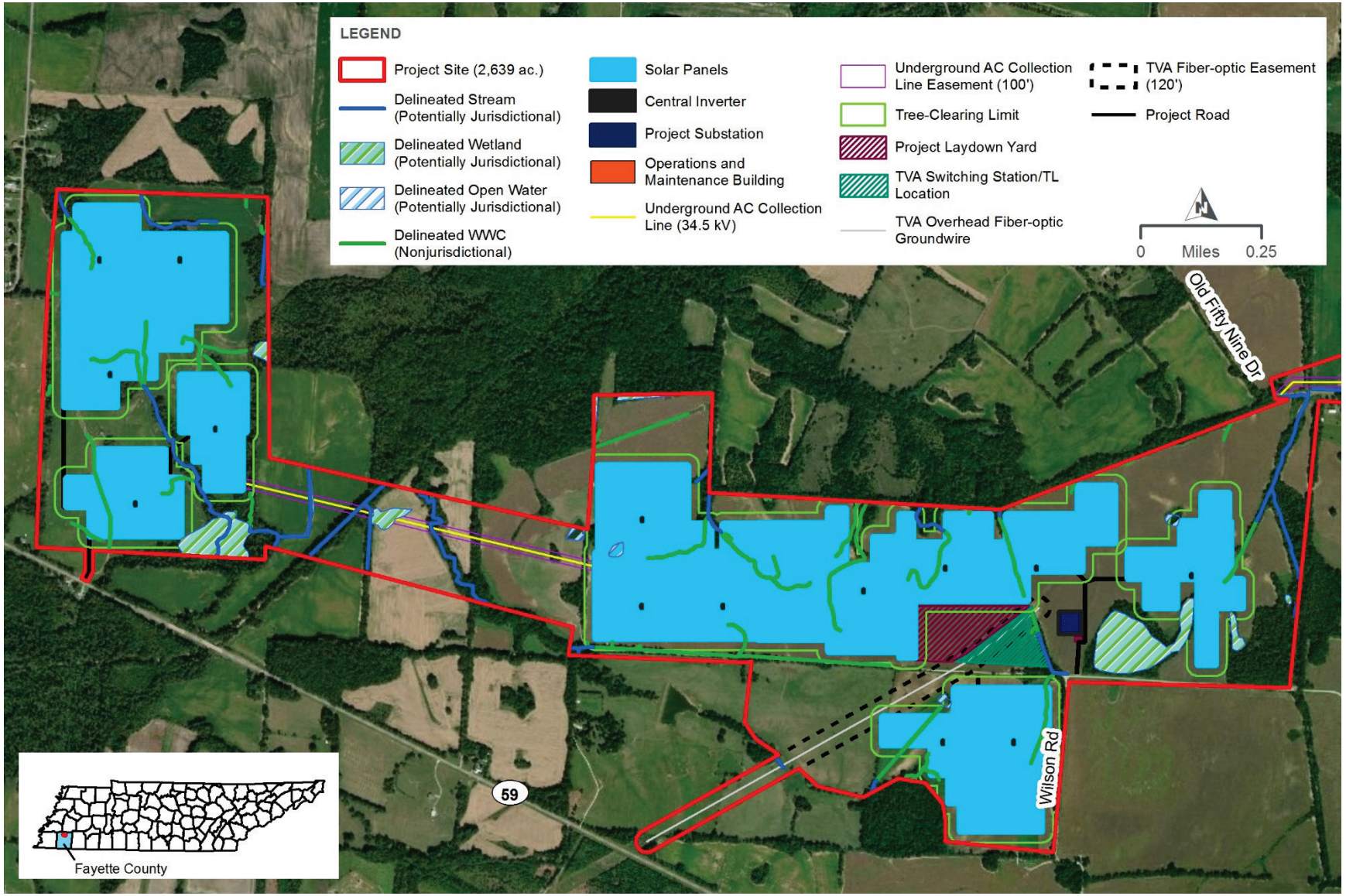

Figure 3-8 West. Impacts to potential Waters of the U.S. on the Project Site.

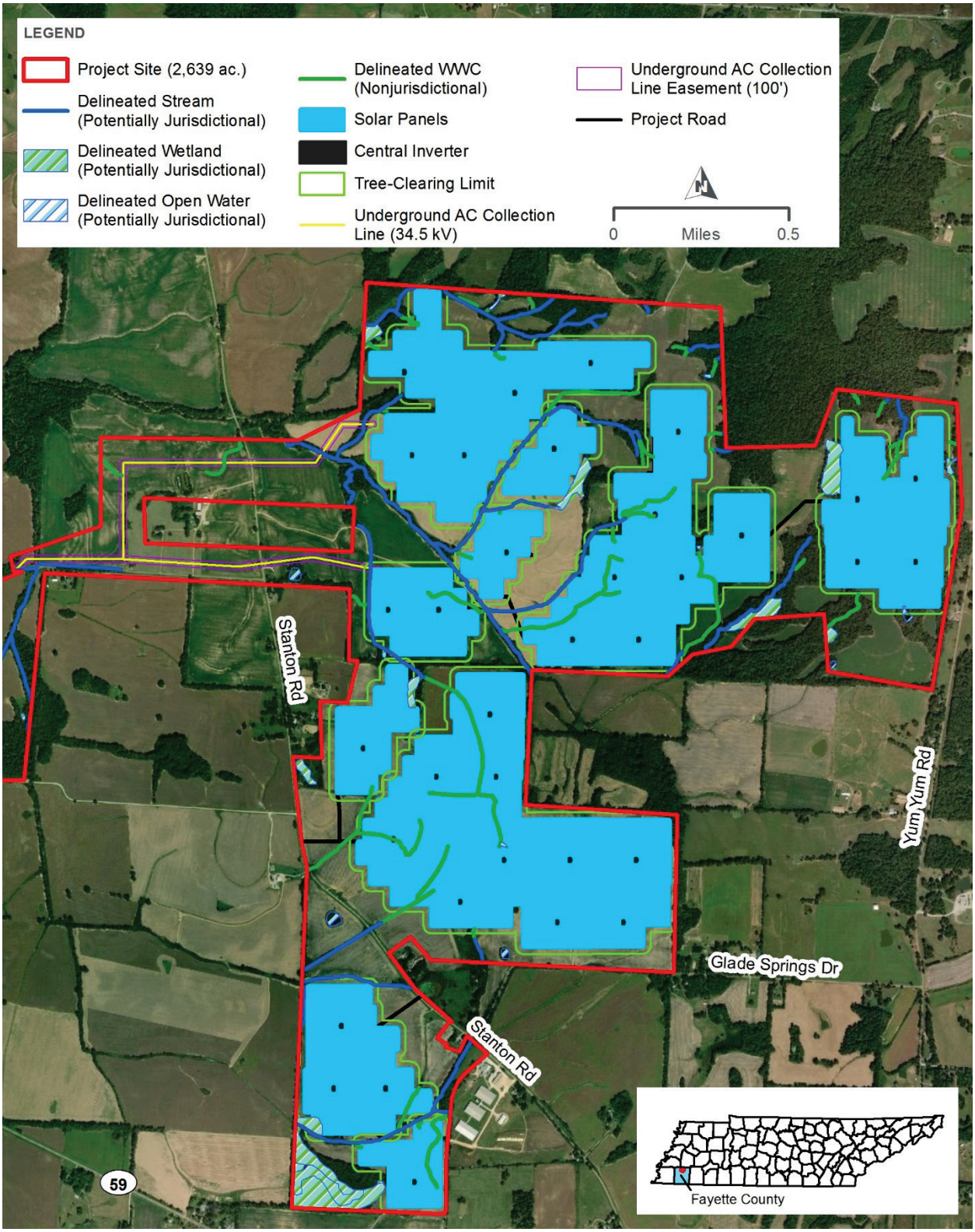

Figure 3-8 East. Impacts to potential Waters of the U.S. on the Project Site.

Floodplains

As a federal agency, TVA is subject to the requirements of E.O. 11988, Floodplain Management. The objective of E.O. 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…" The E.O. 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 E.O. requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. For certain "critical actions", the minimum floodplain of concern is the 500-year floodplain. Critical actions are actions for which even a slight chance of flooding would be too great, such as an emergency facility. The Proposed Action would not be considered a critical action.

The Proposed Action would be consistent with E.O. 11988. The underground AC collection line would cross the FEMA-designated 100-year floodplain of Laurel Creek Canal (Figure 3-8). Some access roads and culverts could also be located within the Laurel Creek floodplain. The installation of underground electric lines, access roads, and culverts are considered to be repetitive actions in the 100-year floodplain, which would result in minor impacts (TVA 1981). These actions would be consistent with EO 11988.

The following measures would minimize adverse impacts to floodplains and their natural and beneficial values:

1. Standard BMPs would be used;

2. Dredge spoil would be disposed of properly in accordance with local, state, and federal regulations at an inland site outside identified floodways; and

3. Ground disturbance would not occur within 25 feet of a perennial stream.

With implementation of the above mitigation measures, the Project would have no significant impact on floodplains and their natural and beneficial values.

3.4 BIOLOGICAL RESOURCES

This section describes the existing biological resources within the Project Site and the potential impacts to those resources that would be associated with the No Action and Proposed Action Alternatives. The components of biological resources analyzed below consist of vegetation, wildlife, and rare, threatened, and endangered species.

The Project Area lies in the Mississippi Valley Loess Plains Level III Ecoregion, which contains two Level IV ecoregions (USEPA 2019a). The Project Site is located within the Loess Plains subecoregion, which is characterized by gently rolling, irregular plains that are approximately 250 to 500 feet in elevation. Agricultural products, including soybeans, cotton, corn, milo, and sorghum crops, in addition to livestock and poultry, are produced in large quantities in the Project Area and surrounding vicinity. Oak-hickory and southern floodplain forests are scattered between large areas of cropland, and cypress-gum forests are present in some swamp and wetland areas.

Average annual air temperature in the Mississippi Valley Loess Plains ecoregion ranges between 60 and 68 degrees Fahrenheit, with higher temperatures in southern portions of the ecoregion (Taylor 2016). The area experiences an average of 45 to 60 inches of precipitation per year, increasing to the south.

A desktop survey was performed prior to field investigations on the Project Site. Potential wildlife, vegetation, and threatened and endangered species were researched during the desktop survey and verified through field investigations on November 13-14, 2018; January 14-17, 2019; March 12, 2019; and April 10-11, 2019. A bat habitat assessment was conducted in April 2019 by Copperhead Environmental Consulting biologists to assess and map potential for bat habitat on the Project Site. Results of the desktop survey and various field investigations are described in this section.

Biological resources are regulated by a number of federal and state laws. The laws and rules relevant to the Proposed Action include:

- Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544);
- Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712) (for actions of nonfederal entities);
- Executive Order for Migratory Birds (E.O. 13186 of January 10, 2001) (for actions of federal agencies);
- Bald and Golden Eagle Protection Act (BGEPA); and
- Rules of the Tennessee Wildlife Resources Agency, Chapter 1660-01-32 (based on authority provided in Tennessee Code Annotated §§ 70-1-206, 70-8-104, 70-8-106 and 70-8-107).

On March 29, 2019, TVA provided lists from its Regional Natural Heritage Database (RNHD) of federally and state-listed species potentially occurring in Fayette County and/or within resources-defined radii of the Project Site or generally listed for the county. TDEC maintains the state's Natural Heritage Inventory Program, which lists rare species by watershed, county, and USGS topographic quadrangle (TDEC 2018b). Lists of rare species were obtained from TDEC on March 28, 2019, for the watershed and topographic quadrangle associated with the Project Site. A U.S. Fish and Wildlife (USFWS) Information for Planning and Consultation (IPaC) planning-level trust resources list was requested on May 1, 2019. This list was obtained to identify federally-listed threatened and endangered species potentially occurring in the Project Area. TVA also consulted with the USFWS under Section 7 of the ESA on potential impacts to federally-listed species in the Project Area (Appendix F).

3.4.1 Affected Environment

Existing biological resources on the Project Site include natural areas, vegetation, and wildlife. Some rare, threatened, or endangered species also have the potential to occur in the Project Area.

3.4.1.1 Natural Areas

One natural area is known to exist within three miles of the Project Site. Sanders Woods is a privately-owned 35.5-acre natural area located off Old 59 Drive, along Laurel Creek, north of the Project Site. This natural area is a mature cherrybark oak-willow oak-shagbark hickory forest with moderate biodiversity significance and is not within the Project Site.

3.4.1.2 Vegetation

Oak-hickory forests typical of the Loess Plains Level IV ecoregion are characterized by a broad diversity of trees, including northern red oak (*Quercus rubra*), pignut hickory (*Carya glabra*), white oak (*Quercus alba*), and mockernut hickory (*Carya tomentosa*) (USGS 2019d). Vegetation on the Project Site has been altered from this typical forest community due to agricultural use. The majority of the Project Site has been cleared for farming or grazing, and portions of the Project Site are currently planted in cotton, corn, or soybeans. The Project Site contains approximately 458 acres of primarily deciduous forest and approximately 2,181 acres of cultivated crops, hayfield/pasture, grassland/shrubland, herbaceous marsh or wet meadow, or open residential or recreational land. Approximately 34 acres of the open land on the Project Site have been developed at low or medium intensities, based on the NLCD evaluation, visualization, and analysis tool (see Section 3.1.1). Most of the forested areas are located along the northeastern corners of the Project Site, between fields, along streams and drainages, and in the wetland areas in the central and western portions. Ruderal forests are present on approximately 44 acres of the Project Site. These forests generally occur in narrow strips or small patches within the agriculturally-managed land on the Project Site as a result of human disturbances.

The predominant species identified in the forested portions of the Project Site during field investigations consist of sweetgum, southern red oak (*Quercus falcata*), black oak (*Quercus velutina*), white oak, American elm (*Ulmus americana*), mockernut hickory, sugar hackberry (*Celtis laevigata*), shagbark hickory (*Carya ovata*), and eastern redcedar (*Juniperus virginiana*). Sawtooth blackberry (*Rubus argutus*), grey willow (*Salix cinerea*), Virginia creeper (*Parthenocissus quinquefolia*), greenbriar (*Smilax* sp.), and poison ivy (*Toxicodendron radicans*) dominate the understory and former agricultural areas containing early successional plant communities. During the growing season, vegetation in the agricultural fields on the Project Site consists of cultivated soybeans (*Glycine max*), corn (*Zea maize*), and cotton (*Gossypium hirsutum*). However, when agricultural fields are fallow, these fields contain native pioneer/early successional and nonnative species common in disturbed areas such as annual bluegrass (*Poa annua*), curly dock (*Rumex* sp.), grape hyacinth (*Muscari neglectum*), and deadnettles (*Lamium* spp.). Vegetation in pastureland and hayfields on the Project Site is dominated by curly dock, greenbriar, white clover (*Trofolium repens*), Johnsongrass (*Sorghum halepense*), tall fescue (*Schedonorus arundinaceus*), broomsedge bluestem (*Andropogon virginicus*), wild onion (*Allium*

sp.), foxtail grass (*Setaria* sp.), buttercup (*Ranunculus* sp.), tiny bluet (*Houstonia pusilla*), and shepherd's purse (*Capsella bursa-pastoris*). In addition to tall fescue, invasive species observed on the Project Site include Chinese privet (*Ligustrum sinese*), mimosa (*Albizia julibrissin*), Nepalese browntop (*Microstegium vimineum*), Japanese honeysuckle (*Lonicera japonica*), bamboo (*Phyllostachys* sp.), and multiflora rose (*Rosa multiflora*). Grassland vegetation types within the Project Site include hayfields and pastures. No uncommon plant communities were identified on the Project Site, and no rare plant communities were observed during field investigation.

3.4.1.3 Wildlife

Habitat assessments for terrestrial animal species were conducted on the Project Site during the field investigations. Each of the vegetative community types described in the prior section offers suitable habitat for animal species common to the region, both seasonally and year-round. Individual species and/or evidence of species incidentally observed during field investigations are listed in the Vegetation and Wildlife Assessment Report (HDR 2019a; Appendix F).

Oak-hickory forests typical of the Loess Plains Level IV ecoregion support a variety of mammals, including the eastern chipmunk, gray squirrel, and fox squirrel. Other common mammals occurring within the ecoregion include the eastern cottontail, raccoons, and white-tailed deer (USFWS 1995). Game birds in the region include the mourning dove and wild turkey. Many of these species are likely to be found in the forested areas near the north and west central portions of the Project Site. However, as the majority of the Project Site is under active agricultural production or grazed, overall species diversity is low, and most species that were observed during the field investigations, such as the nine-banded armadillo, are widespread and relatively common in the area (HDR 2019a).

Deciduous forests, which comprise approximately 17 percent of the Project Site, provide habitat for an array of terrestrial animal species. Birds found in this habitat include the chuck-will's-widow, downy woodpecker, eastern screech-owl, red-eyed vireo, red-tailed hawk, white-breasted nuthatch, wood thrush, and yellow-billed cuckoo (National Geographic 2002). This area also provides foraging and roosting habitat for several species of bats, particularly in areas where the forest understory is relatively open. Some examples of bat species potentially found in this habitat are the big brown, eastern red, evening, hoary, and silver-haired. The coyote, eastern chipmunk, eastern woodrat, North American deermouse, and woodland vole are other mammals potentially present in deciduous forests (Kays and Wilson 2002). Common reptiles include the gray ratsnake, midland brownsnake, and scarlet kingsnake (Conant and Collins 1998). In forested portions with water features, amphibians may include the dusky, marbled, mole, and spotted salamander, as well as the barking tree frog and Cope's gray tree frog (Conant and Collins 1998; Niemiller and Reynolds 2011).

Wetlands and associated vegetation areas, which compose approximately 2 percent of the Project Site, provide habitat for such birds as the northern harrier, prothonotary warbler, red-winged blackbird, song sparrow, swamp sparrow, and white-throated sparrow (National Geographic 2002). Mammals that may utilize this habitat include the American beaver, eastern harvest mouse, marsh rice rat, muskrat, nutria, and swamp rabbit (Kays and Wilson 2002). The

common gartersnake, eastern black kingsnake, eastern ribbonsnake, gray ratsnake, and midland watersnake are all potential wetland reptiles (Conant and Collins 1998). The eastern red-spotted newt and three-lined salamander, as well as the American bullfrog, bird-voiced tree frog, green frog, northern cricket frog, pickerel frog, and southern cricket frog are examples of some amphibians that may be present in wetlands on the Project Site (Niemiller and Reynolds 2011).

Agricultural fields, hayfields/pasture land, and other herbaceous areas such as lawns, which comprise approximately 83 percent of the 2,639-acre Project Site, offer habitat to such bird species as the blue grosbeak, brown-headed cowbird, brown thrasher, common grackle, common yellowthroat, dickcissel, eastern bluebird, eastern kingbird, eastern meadowlark, eastern towhee, field sparrow, grasshopper sparrow, house finch, northern mockingbird, and prairie warbler among others (National Geographic 2002). Mammals potentially present in fields or pasture include the eastern cottontail, eastern harvest mouse, eastern woodrat, hispid cotton rat, red fox, and striped skunk (Kays and Wilson 2002). Reptiles with the potential to occur in agricultural portions of the Project Site include the eastern milk snake, eastern slender glass lizard, gray ratsnake, smooth earth snake, and southern black racer (Conant and Collins 1998).

Review of the TVA RNHD indicated that no caves were documented within a three-mile radius of the Project Site. No caves were identified during field investigations of the Project Site. No unique or important terrestrial or aquatic habitats were identified within the Project Area. In addition, no migratory or wading bird colonies were observed on the Project Site or the immediate vicinity.

Migratory Birds

E.O. 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) directs federal agencies to take certain actions to further implement the MBTA. The MBTA prohibits the “take” of migratory birds. The regulatory definition of “take” as defined by 50 CFR § 10.12, means ‘to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue hunt, shoot, wound, kill, trap, capture, or collect.” Agencies are also prohibited from the following actions with respect to migratory bird nests: “possession, sale, purchase, barter, transport, import and export, take, and collect.” The MBTA is executed and enforced by USFWS. Yum Yum Solar and its contractors would act in compliance with the MBTA.

The Project Site is located within the Bird Conservation Region 27 (BCR 27), Southeastern Coastal Plain (NABCI 2009). There are 53 species of conservation concern in this region, including various species of songbirds, shorebirds, woodpeckers, owls, and raptors (USFWS 2008). The USFWS IPaC planning-level trust resources report did not identify any species of migratory birds (not including the bald eagle or golden eagle, which are discussed in the next section) listed on the USFWS 2008 Birds of Conservation Concern (BCC) as having potential to occur in the Project Area. However, six of the 53 species have been observed in Fayette County as part of the Breeding Bird Survey or Christmas Bird Counts (HDR 2019a). These include the Chuck-will’s widow, Kentucky warbler, prothonotary warbler, red-headed woodpecker, whip-poor-will, and wood thrush.

BCC are those species that are a high conservation priority of the USFWS. Suitable habitat for some of these species may occur in forest edges and scrub/shrub portions on the Project Site. Some may also use agricultural or grassland habitats for foraging.

Oak-hickory forest, bottomland forest, and woodland areas within the Project Site provide potential breeding habitat for many of these species including Bewick's wren, chuck-will's-widow, eastern whip-poor-will, prothonotary warbler, red-headed woodpecker, Swainson's warbler, and wood thrush. Although hayfields and ponds with associated marsh habitats are only a small percentage of the Project Site, these may be used by bird species in the winter, such as the Le Conte's sparrow or rusty blackbird, or as migration stopover habitat for buff-breasted sandpiper, lesser yellowlegs, long-billed curlew, Nelson's sparrow, sedge wren, and upland sandpiper. Shrubby habitats at woodland edges near hayfields, wooded fencelines, powerline ROWs, and hayfields may provide suitable habitat for species such as Bachman's sparrow, loggerhead shrike, painted bunting, and prairie warbler.

3.4.1.4 Rare, Threatened, and Endangered Species

Threatened and endangered species are regulated by both federal and state governments. Database research as described in Section 3.4 identified two federally listed species, seven state-listed species, and four species with state ranks or statuses with the potential to occur on the Project Site. The USFWS IPaC report identified two federally listed species, with one listed as endangered and the other listed as threatened (Table 3-4; USFWS 2019). Within a ten-mile radius of the Project Site, TVA's RNHD included no additional federally listed species and indicated four species with state ranks or statuses. The TDEC Natural Heritage Inventory Program identified three state-listed species potentially occurring in the Project Area. No designated critical habitats are present on the Project Site (USFWS 2019). Each federally listed, state-listed, and protected species is discussed in this section in relation to potential habitat on the Project Site.

A field survey of biological resources on the Project Site was conducted by HDR, Inc. (HDR) on November 13-14, 2018, January 14-17, 2019, March 12, 2019, and April 10-11, 2019 (Appendix F). The survey focused on the general characteristics of the land cover, vegetation communities, and wildlife habitats currently present within and adjacent to the Project Site to support a preliminary evaluation of the potential for special status species to occur on the site. This section evaluates those biological resources.

Federally Listed Species

Federally listed species determined during database research as having the potential to utilize the Project Area are shown in Table 3-4. These species consist of two mammals that are either endangered or threatened.

Table 3-4. Federally listed species potentially occurring in the Project Area

Common Name	Scientific Name	Status	Preferred Habitat	Potential Habitat on Project Site
Mammal				
Indiana Bat	*Myotis sodalis*	E	Indiana bats spend winter hibernating in caves and mines, called hibernacula. Suitable migratory and summer habitat consists of the presence of suitable (i.e. open enough for bats to access) drinking water and forested and aquatic foraging areas with Potential Roost Trees (PRT). A PRT has exfoliating bark, cracks, crevices or cavities and is greater than or equal to 5-inches diameter at breast height (DBH).	Yes
Northern Long-Eared Bat	*Myotis septrentrionalis*	T	Northern long-eared bats (NLEB) spend winter hibernating in caves and mines, called hibernacula. Suitable migratory and summer habitat consists of the presence of suitable (i.e. open enough for bats to access) drinking water and forested and aquatic foraging areas with PRT. A PRT for NLEB has exfoliating bark, cracks, crevices or cavities and is greater than or equal to 3-inches DBH.	Yes

E = Endangered; T = Threatened

Habitat assessments in accordance with the 2018 “Range-wide Indiana Bat Summer Survey Guidelines, US Fish and Wildlife Service” (USFWS 2018) were conducted by Copperhead Environmental Consulting, for both the Indiana and NLEB on March 27-29, 2019. The results are presented in a separate bat habitat assessment report (Appendix F). The bat habitat assessment, which was conducted on 3,320 acres that encompassed the Project Site, determined that most forested areas on the Project Site provide potentially suitable summer roosting and foraging habitat for the federally listed Indiana bat and NLEB based on the presence of snags and trees with exfoliating bark. Suitable summer bat habitat for these species, as defined by USFWS (2018), was delineated as forests or woodlots containing potential roost trees (PRTs) that are greater than or equal to 5 inches in diameter at breast height (DBH) and therefore suitable for Indiana bats and NLEBs and forests or woodlots that are suitable only for NLEBs due to the presence of only smaller PRTs 3-4 inches DBH. Within the 3,320-acre investigated area, a total of 477 forested acres contain suitable habitat for both the Indiana bat and NLEB, and 325 acres of forest contains habitat for only the NLEB. In total 802 acres of forest may provide suitable habitat for federally listed bats. Streams, wetlands, and open areas on the Project Site may also provide suitable foraging habitat for these species. Caves, mines, or cave-like structures that could be suitable for hibernacula do not exist on the Project Site. Suitable summer roosting habitat for NLEBs may be associated with four barns or other buildings located on the Project Site. All of these buildings are located within forested areas identified as suitable summer roosting habitat in the bat habitat assessment report (Appendix F).

State-Listed Species

The TVA RNHD and the TDEC Natural Heritage Inventory Program were also consulted to identify state species of concern having the potential to occur in the Project Area. Table 3-5 provides a summary of state-listed species.

Table 3-5. State-listed species potentially occurring in the Project Area

Common Name	Scientific Name	Status	Preferred Habitat	Habitat present on Project Site
Fish				
Northern Madtom	*Noturus stigmosus*	D	Freshwater creeks with swift currents along sand, silt, or rocky substrates.	No
Mammal				
Meadow Jumping Mouse	*Zapus hudsonius*	D	Open grassy fields; often abundant in thick vegetation near water bodies; statewide.	Yes
Southern Bog Lemming	*Synaptomys cooperi*	D	The grassy openings and edges of forests, especially where sedges, ferns, and shrubs grow and when the soil is loose and crumbly.	Yes
Southeastern Shrew	*Sorex longirostris*	D	Various habitats including wet meadows, damp woods, and uplands; statewide.	Yes
Shortleaf Rush	*Juncus brachyphyllus*	S	Open moist, sandy ground	No
Small-flowered Beardtongue	*Penstemon tubiflorus*	S	Open prairies to deciduous woodlands, disturbed areas, along railroads, rocky glades.	Yes
Piebald Madtom	*Noturus gladiator*	D	Large creeks and rivers in moderate-swift currents with clean sand or gravel substrates; Mississippi River tributaries	No

D – Deemed in need of management; S – Species of concern

Three mammals deemed in need of management were found to have the potential to occur on the Project Site based on proximity to known records and presence of suitable habitat: the meadow jumping mouse, southeastern shrew, and southern bog lemming. Meadow jumping mice prefer grasslands but may also utilize pasture, fields with shrubs, fencelines, and the perimeter of forested areas (TWRA 2019c). Often, selected habitats are in moist areas or near water. Meadow jumping mice breed from May to August. Southeastern shrews favor wetlands, such as swamps, bogs, or marshes, but may also use river edges and abandoned fields, particularly after rain. Breeding season occurs once or twice each year, with one litter in April, occasionally followed by a second litter in the summer. Southeastern shrews construct leaf litter nests underneath fallen trees or within hollow logs. Southern bog lemmings typically make use of grassy, moist fields, meadows, or thickly vegetated swamps, where they live in groups of 20 to 30 individuals. Moist

forests and bogs may also be used. Underground tunnels in these habitats serve as locations for feeding, resting, storing food, and nesting. The habitats these mammals utilize, including forested areas and perimeters, open grassy or shrubby fields, pasture, fence rows, and wetlands and other moist areas, are present on the Project Site, and as such, these species have the potential to occur in these locations.

During database research, two fish species deemed in need of management were identified as having the potential to occur on the Project Site: the northern madtom and the piebald madtom. Both species are a type of freshwater catfish that have been found throughout the midwestern United States. The fish prefer large creeks and small rivers with moderate current and clear to turbid water, where they favor open areas with only some cover from vegetation or debris and avoid silty conditions. Sand and mud bottoms and streams with swift rocky riffles are preferred. These fish are not expected to be present in the Project Area due to the lack of stream habitat fitting the favored conditions of either species.

No plant species of special concern were observed during the pedestrian survey. The majority of the soils (99 percent) on the Project Site are silty loams; no sandy hills, prairies, or barrens occur on the Project Site. Therefore, shortleaf rush is unlikely to occur on the Project Site. Mesic deciduous woodlands, ponds, streams, and disturbed wetlands and uplands do occur in the Project Area; therefore, prickly hornwort, cluster fescue, and small-flowered beardtongue could potentially occur in the mesic forest or disturbed marsh portions of the Project Site.

Bald and Golden Eagle Protection Act

Both bald and golden eagles are protected by the MBTA and the Bald and Golden Eagle Protection Act of 1940 (BGEPA, 16 U.S.C. 668-668d). Under the BGEPA it is illegal to kill, harass, possess (without a permit), or sell bald and golden eagles and their parts. According to TVA's RNHD and the TDEC Natural Heritage Inventory Program, there are no records of bald eagles or golden eagles in Fayette County. Bald eagles and golden eagles have been observed within ten miles of the Project Site in the Hatchie National Wildlife Refuge. Bald eagles typically utilize forested areas adjacent to large bodies of water for nesting habitat. Tall, mature coniferous or deciduous trees that afford a wide view of the surroundings are used as nest trees and roost trees. Bald eagles typically avoid heavily developed areas. Suitable nesting habitat for bald eagles generally consists of prominent trees along riparian corridors on large bodies of water. Foraging habitat in Tennessee includes reservoirs and large rivers. Bald eagles are known to nest in Tennessee, with 175 nesting pairs as of 2012 (TWRA 2019d). While suitable nesting trees occur within the Project Area, no large bodies of water are located on the Project Site or within ten miles. No bald eagles or bald eagle nests were observed during the field investigations, and the likelihood is low that bald eagles would be found in the Project Area due to the distance to large waterbodies. Therefore, bald eagles are unlikely to nest on the Project Site.

Golden eagle nesting habitat includes river cliffsides and bluffs. However, in the vicinity of the Project Area, the golden eagle occurs as a rare winter resident. Wintering habitat includes forests area with open foraging habitat. Golden eagles have been recorded at natural areas and wildlife refuges in southwestern Tennessee, the nearest being documented in the Hatchie National Wildlife Refuge, ten miles northeast of the Project Site (Cornell Lab of Ornithology 2018). The

Project Area encompasses suitable winter roosting and foraging habitat. Though the likelihood is low the golden eagle could potentially occur on the Project Site in winter but would not be found nesting on site.

3.4.2 Environmental Consequences

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

3.4.2.1 No Action Alternative

Vegetation

Under the No Action Alternative, there would be no Project-related impacts to the existing vegetation in the Project Area, and existing agricultural areas would likely remain in agricultural production. Over time, it is possible that the open-field areas on the Project Site could become developed and the forested areas could become cleared if the resident population in the area increases or land uses change.

Wildlife

Under the No Action Alternative, there would be limited impacts to wildlife in the Project Area. Existing land use would remain as a mix of agricultural, developed and undeveloped land. The agricultural fields on site would be expected to continue to be regularly used, limiting their use by wildlife.

Rare, Threatened, and Endangered Species

Under the No Action Alternative, no Project-related impacts to rare, threatened, and endangered species would be anticipated because habitat for listed species is either absent from the Project Site or would not be impacted under the No Action Alternative.

3.4.2.2 Proposed Action Alternative

Under the Proposed Action, direct impacts to vegetation and wildlife may result from construction and operation of the Project.

Vegetation

Under the Proposed Action, the solar facility would have direct impacts to vegetation. While most of the site is agricultural fields, up to 150 acres of trees and other tall vegetation have the potential to be removed from the approximately 1,624 acres of land proposed for Project components. The trees within approximately 100 feet of proposed panel and inverter blocks would be removed to prevent shading of the solar array. The remaining portions of the Project Site outside of the developed area (totaling approximately 1,015 acres; 38 percent of the Project Site) would be primarily undisturbed. Following construction, disturbed areas would be seeded with native and/or noninvasive vegetation, and the solar facility would be maintained to prevent vegetation from growing taller than 18 inches, as described in Section 2.2.3. This would result in the long-term

conversion of approximately 1,624 acres of the Project Site from agricultural fields with scattered forested or scrub/shrub areas to a mix of native and/or noninvasive vegetation.

Invasive species on the Project Site would be managed with selective herbicides or graded and cleared. To minimize the introduction and spread of invasive species, standard operating procedures would be implemented consistent with E.O. 13112 (Invasive Species) for revegetating with noninvasive plant species. It is likely that construction of the Project would result in localized increases of invasive plants, but the plants most likely to colonize the area are distributed widely throughout the region. Effects would be further reduced because revegetation of the site would be accomplished using native and/or noninvasive species. The Project would not significantly contribute to the spread of exotic or invasive species.

Direct impacts to forested land would be minimal under the Proposed Action as most of the trees on the Project Site are located outside of the area proposed for development of the solar facility. Approximately 150 acres of forested land, constituting approximately 33 percent of existing forested land on the Project Site, may be cleared for placement of Project components or to prevent shading of solar panels. Approximately 91 acres of the impacted forested land (61 percent of the Project-impacted forested land) consists of a ruderal forest type, which generally occurs in narrow strips or small patches among agricultural fields on the Project Site. In addition, approximately 51 acres of grassland/pasture land would be impacted for placement of Project components. Project components would not be constructed within a 25-foot buffer of the jurisdictional streams and wetlands, and the buffer area would generally be avoided during construction. Tree removal associated with the Project would be minimized to the extent possible, particularly to the north of proposed components, as trees in this vicinity would not shade the solar panels.

Taking into consideration the large amount of similar vegetation types in the area both regionally and locally, clearing the existing vegetation and light grading would be considered minor impacts. Approximately 2,181 acres (83 percent) of the 2,639-acre Project Site are agricultural fields, pastures, or otherwise cleared, open land, while approximately 458 acres (17 percent) of the Project Site are forested. The surrounding area consists of similar vegetation communities, and the effects of the conversion of agricultural and open land in this context would be relatively small. Implementation of the Project would not affect unique or important vegetation communities.

Wildlife

Under the Proposed Action, the proposed solar facility would be constructed on the Project Site with direct impacts to certain types of wildlife habitat. Approximately 150 acres of forest habitat may be cleared within the 1,624-acre portion of the Project Site proposed for development. Approximately 91 acres (61 percent) of the impacted forest is the ruderal forest type. This forest type generally occurs in linear patches along field borders or streams and in smaller patches within the agricultural landscape and consists of early successional species, smaller trees, higher understory cover, and higher incidence of nonnative species. Although these areas may be linear or in smaller patches, they represent patches of refugia or corridors for movement for forest-dependent wildlife. The removal of forested habitat from the site would have direct and indirect effects on common migratory bird and mammal species that utilize wooded habitat on the site.

This would result in the temporary to long-term displacement of any wildlife (primarily common native or naturalized species) using the area. Direct effects to some individuals may occur if those individuals are immobile during the time of vegetation removal.

Habitat loss likely would disperse mobile wildlife into surrounding areas in an attempt to find new food and shelter sources and to reestablish territories. Considering the amount of similar quality habitat in the surrounding landscape, it is unlikely that any populations of wildlife species would be unable to relocate successfully. Therefore, the Project would have minor impacts on populations of common wildlife species.

Migratory Birds

Potential winter and migratory stopover habitat occurs on the Project Site for the buff breasted sandpiper, Le Conte's sparrow, lesser yellowlegs, long-billed curlew, Nelson's sparrow, rusty blackbird, sedge wren, solitary sandpiper, and upland sandpiper in grasslands/pastures, and wetlands. The Project would not impact wetlands, therefore the shorebirds listed above would not be impacted. The forested habitat surrounding these water features may be manually removed to prevent shading of PV panels, however. In addition, approximately 51 acres of grassland/pasture habitat would also be impacted by the Project. Suitable winter and stopover habitat is available on the landscape adjacent to the Project Site; therefore, the Project is not anticipated to adversely affect edge wren, Le Conte's sparrow, Nelson's sparrow, and rusty blackbird.

Although the installation of Project components may reduce the foraging potential of the Project Site, the Project is not anticipated to have an adverse effect on migratory birds of conservation concern that require open country with scattered trees and shrubs, such as the peregrine falcon and the loggerhead shrike. The Project would remove approximately 91 acres of open, shrubby woodlands, which provide habitat for migratory birds such as Bewick's wren, blue-winged warbler, painted bunting, prairie warbler, and red-headed woodpecker. The Project would avoid impacts to nesting birds by clearing trees and other tall vegetation during the nonbreeding season. Similar habitat type is available adjacent to the Project Site and would likely absorb displaced individuals. Therefore, the Project would have no adverse effect on these species.

The Project would not be removing mature, deep, shady forest and bottomland forest, which provides habitat for species such as black-throated green warbler, chuck-wills-widow, Kentucky warbler, prothonotary warbler, Swainson's warbler, whip-poor-will, and wood thrush. Therefore, the Project would have no adverse effect on these species.

Rare, Threatened and Endangered Species

Federally listed Species

The Project Site is predominantly agricultural land; no known caves are on the Project Site or within a 3-mile vicinity of the Project Site for use by bat species as winter hibernacula. Suitable summer foraging and roosting habitat for the Indiana bat and NLEB occur within the forested areas on the Project Site; however most of this would be avoided by the Project. All habitat found to be suitable summer roosting habitat for Indiana bat would be avoided. While none of the four buildings that may be suitable NLEB habitat would be removed for the Project, approximately 67.4

acres of potentially suitable summer roosting habitat for only the NLEB would be removed for the construction of the proposed solar facility and electrical interconnection. However, all potentially suitable summer roosting habitat would be removed between October 15 and March 31 when these bats would be roosting in caves, and all wetlands would be avoided. This would ensure there would be no direct impacts to NLEB. TVA determined that the Proposed Action may affect, but is not likely to adversely affect, the NLEB, and that the Proposed Action would not affect the Indiana bat. Consultation under Section 7 of the ESA was performed with the USFWS on June 11, 2019. Concurrence was received from the USFWS on June 21, 2019 (Appendix F).

State-listed Species

Potentially suitable habitat, such as pasture/grassland, shrubby forest edges, and herbaceous wetland, is present on the Project Site for the southeastern shrew, meadow jumping mouse, and southern bog lemming. The Project would impact approximately 150 acres of forested land, primarily linear strips and small patches, with approximately 15 linear miles of forest edges. Most of these edges are adjacent to heavily managed row crop land. Approximately 51 acres of pasture/grassland areas would be impacted by the Proposed Action; however, 9 acres occur within existing powerline corridors and 7.5 acres of this type are isolated by row crop land use. Approximately 35 acres of potentially suitable grassland/pasture habitat would be impacted. Therefore, the Project would result in minor habitat loss for these species and is not anticipated to adversely affect the local population, if present. Direct effects to some individuals may occur if those individuals are immobile during the time of habitat loss. This could be the case if activities were to take place during breeding/nesting seasons.

Mesic deciduous woodlands, ponds, streams, and disturbed wetlands and uplands on the Project Site provide potential habitat for small-flowered beardtongue to potentially occur in the mesic forest or disturbed marsh portions of the Project Site. While the Project would not impact wetlands, the habitat surrounding these water features has the potential to be manually removed to prevent shading of PV panels. Project impacts to deciduous forest areas in wetland areas would reduce potential habitat for these plants on the Project Site.

The Project would have no impact on the northern madtom or the piebald madtom, as these fish are not expected to be present on the Project Site.

Bald and Golden Eagles

Although large trees which may meet the needs for a bald eagle nest or roost site occur within the Project Area, no large bodies of water are located on the Project Site or within ten miles. Bald eagles are unlikely to nest or forage on the Project Site due to the distance to large waterbodies. Therefore, the Project would have no impact on the bald eagle. The golden eagle occurs as a rare winter resident in Tennessee. The Project Site encompasses suitable winter roosting and foraging habitat; therefore, the golden eagle could potentially occur on the Project Site. However, due to the rarity of golden eagles in the region and the availability of suitable roosting and foraging in nearby similar habitat, and the lack of nesting in the region, the Project is not expected to impact golden eagles.

3.5 VISUAL RESOURCES

This section describes an overview of the visual resources in and surrounding the Project Area and the potential impacts on these visual resources that would be associated with the No Action and Proposed Action Alternatives.

3.5.1 Affected Environment

Visual resources compose the visible character of a place and include both natural and human-made attributes. Visual resources influence how an observer experiences a particular location and distinguishes it from other locations. Such resources are important to people living in or traveling through an area and can be an essential component of historically and culturally significant settings. For this analysis, the scenery management system (SMS) and associated analytical assessment procedures developed by the US Forest Service are adapted for use within a natural and human-built environment and integrated with planning methods used by TVA (after TVA 2016; USDA 1995). The general Project Area viewshed is evaluated based on its scenic attractiveness and scenic integrity. Scenic attractiveness is a measure of the scenic beauty of a landscape and is based on perceptions of the visual appeal of landforms, waterways, vegetation, and the human-built environment. Scenic attractiveness is assessed as either distinctive, typical/common, or indistinctive. As adapted for this analysis, scenic integrity measures the degree of visual unity of the natural and cultural character of the landscape. Scenic integrity is evaluated as either low, moderate, or high. This analysis also considers the existing character of the Project Site as an important factor in understanding the affected environment.

The Project Site itself is mostly agricultural fields and pasture with forested areas framing most open fields and interspersed throughout, with the largest concentration of trees in the northeast portion. Photo 3.5-1 and Photo 3.5-2 present general views of the Project Site. Generally, the Project Area is rural and agricultural with isolated single-family homes, small residential concentrations, and some industrial development adjacent to the Project Site and as distance from the Project Site increases. The topography of the Project Area is characterized by flat terrain to gently rolling hills interspersed with stream drainages. Scenic attractiveness of the Project Area is rated as typical or common of a rural-agricultural and sparsely residential area. Scenic integrity is assessed as moderate to high due to the relative unity of the surrounding natural and cultural character.

Photo 3.5-1. Looking west along Glade Springs Drive in the southeast portion of the Project Site (taken in March/April 2019).

Photo 3.5-2. Looking northwest toward the Project Site from SR 59 and Winfrey Road (taken in March/April 2019).

Prominent visual resources surrounding the Project Site include numerous scattered residential farm complexes, particularly along or off of SR 222, Old 59 Drive, Yum Yum Road, and SR 59; two small residential concentrations, one to the northwest and one adjacent to the central portion of the Project Site; five churches, two to the northeast and three to the southeast; and Oak Grove Gin and Warehouse to the southeast. SR 222 (Stanton Road) extends north-south through the central portion of the Project Site. SR 59 traverses along portions of the southwestern boundary of the Project Site, and Yum Yum Road generally frames the eastern boundary of the Project Site. A large electrical TL corridor passes northeast/southwest through the eastern portion of the Project Site and continues to the north and south of the Project Site. Another large electrical TL corridor, TVA's existing Cordova-South Jackson 161-kV TL, passes east-northeast/west-southwest through the central portion of the Project Site and continues to the north and south of the Project Site. Forested land concentrates to the north, east, and south of the Project Site. The Fayette County Industrial Park and Fayette Ware High School, East Junior High School, and Jefferson Elementary School are located approximately two miles to the southeast of the Project Site along SR 59. The John S. Wilder Youth Development Center is located off of SR 59, approximately 2.15 miles to the southeast of the Project Site. The long-range views from these facilities are obscured by surrounding wooded areas.

Numerous residential farm complexes containing single-family residences and associated farm buildings and storage bins are scattered throughout the Project Area, particularly along SR 222, Old 59 Drive, Yum Yum Road, SR 59, and along local roads off of these larger roads and highways. Generally, the residences are surrounded by mature trees and several farm buildings that obscure some distant views. Photo 3.5-3 and Photo 3.5-4 show representative views from two residential farm complexes toward the Project Site.

Photo 3.5-3. A residential farm complex along Old 59 Drive, adjacent to the central portion of the Project Site, looking southeast from Old 59 Drive (Google Streetview).

Photo 3.5-4. A residential farm complex along Yum Yum Road, adjacent to the eastern portion of the Project Site, looking west northwest from Yum Yum Road (Google Streetview).

Of the two small residential concentrations near the Project Site, the closest of these is adjacent to the central portion of the Project Site, primarily located along the east side of SR 222, between Fowler Drive and Old 59 Drive. While a few of the residences in this concentration were present by the early 1950s, most or all were built by the early 1980s (USGS 2019b). The residences primarily consist of one-story brick ranch-style houses on lots surrounded by mature hardwoods and pines and/or among agricultural fields framed by mature trees.

The other small residential concentration near the Project Site is located along Wagon Wheel Road and Brewer Road, to the west of the Project Site. This concentration consists of one-story brick ranch-style houses and manufactured homes that were constructed largely between the 1950s and 1990s (USGS 2019b). The residences are generally on lots framed with mature pines and hardwoods, and fields similarly framed by trees are visible in the distance (Photo 3.5-5).

Photo 3.5-5. View from the small residential concentration along Wagon Wheel Road, at a location east of Wilder Road, looking east northeast toward the Project Site (Google Streetview)

Oak Grove United Methodist Church and Pulliam Chapel Church are the nearest of the five churches in proximity to the Project Site. These two churches are adjacent to the southeast of the Project Site, along SR 222 near Oak Grove Gin and Warehouse. Long-range views in all directions from these churches are obscured by mature trees on the church properties as well as those framing fields and/or roads nearby (Photo 3.5-6). Shiloh United Methodist Church and Pleasant Grove Missionary Baptist Church are located northeast of the Project Site, near the unincorporated community of Yum Yum. Mature trees generally line Yum Yum Road in the vicinity of Shiloh United Methodist Church, and the church property is well wooded and does not afford substantial long-range views in any direction. Near Pleasant Grove Missionary Baptist Church and cemetery, trees are sparse immediately along Yum Yum Road; however, a dense concentration of mature trees is extant in the western portion of the church property. Power House Church of God is located along the north side of SR 59, south of the Project Site. Mature trees in the northern portion of the property prevent views to the north.

Photo 3.5-6. Oak Grove United Methodist Church along SR 222 (Stanton Road), adjacent to the southeast portion of the Project Site, looking northeast from SR 222 (Google Streetview)

Oak Grove Gin and Warehouse is located adjacent to the southeast corner of the Project Site, along and south of SR 222 (Stanton Road) (Photo 3.5-7 and Photo 3.5-8). This moderately-sized agricultural processing complex contains several large warehouses, other buildings, and agricultural storage bins, some of which were present by at least the 1950s (USGS 2019b). The complex is generally surrounded by fields that are framed by trees in the near distance.

Photo 3.5-7. View of Oak Grove Gin and Warehouse, looking south from SR 222 (Stanton Road) (taken in March/April 2019).

Photo 3.5-8. View of Oak Grove Gin and Warehouse, looking south from Glade Springs Drive (taken in March/April 2019).

3.5.2 Environmental Consequences

This section describes the potential impacts to visual resources should the Proposed Action or No 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 would not be constructed; therefore, no Project-related impacts to visual resources would result. Existing views of the Project Site would be expected to remain relatively unchanged from the predominant mix of agricultural, rural-residential, and forested land. Impacts to visual resources are likely as the nearby communities of Yum Yum, Braden, Oakland, and Somerville grow. Additionally, visual changes may occur over time as vegetation on the Project Site changes. For example, if the land were no longer mowed or cultivated, vegetation would change from low-profile plants to shrubs and trees.

3.5.2.2 Proposed Action Alternative

Visual concerns are often associated with both large and small-scale solar facilities and their electrical infrastructure. The Project Site consists of relatively flat to gently sloping terrain, and the Project would convert what is largely now agricultural, rural-residential, and forested lands to an industrial use mostly consisting of low-profile PV arrays. Figure 2-2 and Figure 2-4 show the proposed Project elements, including the proposed switching station and TL connection.

During the March and April 2019 site visits, the HDR field team assessed the potential for visual impacts from the Proposed Action. Per Fayette County requirements, the Project would be set back from SR 59 and SR 222 by at least 500 feet. Long-range views from the numerous residential farm complexes, primarily along or off of SR 222, Old 59 Drive, Yum Yum Road, and SR 59, are generally limited by mature trees and farm buildings. Likewise, long-range views from the two residential concentrations near the Project Site, along and off of SR 222 and along and off of Wagon Wheel Road, and Oak Grove Gin and Warehouse and several churches in the Project Area are largely limited by mature hardwoods and pines. Mature trees, combined with the minimum 500-foot setback of the Project, would generally shield views of distant Project elements from travelers on SR 59 and Old 59 Drive. However, some Project elements would be visible from portions of these properties and roadways.

Travelers along portions of Fowler Road and Yum Yum Road may notice visual changes that would vary by location, as there are generally narrow buffers of trees between these roadways and areas of proposed solar panels. Observers along an approximate 0.6-mile length of SR 222, between a point north of Oak Grove United Methodist Church and a little north of Fowler Road, would view somewhat larger portions of the Project to the northeast, as fewer trees buffer views in this location where solar panels are proposed, except at the edge of distant fields. However, only one residential farm complex, located on a private road along the west side of SR 222, south of Fowler Road, is located on SR 222 in this vicinity, and several mature hardwoods and some farm buildings and storage bins partially obscure views from this property. Additionally, the anti-reflective PV panel surfaces would minimize or eliminate negative impacts such as glare and reflection, and occupants of the approximately 670 daily vehicles (TDOT 2018) traveling north or south on SR 222 in this vicinity would likely view the relatively distant solar facility for less than 1 minute.

Overall, while portions of the Project would be visible across open fields or otherwise clear areas, residential and commercial properties and roadways in the Project Area generally have mature trees along or near property boundaries that would partially or fully obscure views to the Project Site from many vantage points. The relatively stable elevations and the maintenance of existing vegetation along the perimeter of the Project Site would largely shield views from most Project Area vantage points to the Project Site.

Construction of the proposed Project would temporarily alter the visual character of the Project Area. During construction, heavy machinery would be present, changing the visual aspects from Project Area vantage points. Within the 1,624-acre area to be developed for the Project, trees and other tall vegetation would be removed, and the area would be graded, changing the contour, color, and texture of the scenery attributes. The Project Site would appear as a mixture of neutral

colors such as browns and grays due to earthmoving, road construction, and concrete activities. Water would be used to keep soil from aerosolizing; thus, dust clouds are not anticipated. Visual impacts from construction would be minimal at night since most construction is anticipated to occur during the day. Erosion control silt fence and sediment traps would be removed once construction is complete, and bare areas would be promptly vegetated.

From Project Area vantage points along and off of SR 222 near SR 59, Yum Yum Road, Glade Springs Drive, and Fowler Drive near SR 222, the manufactured, structured appearance of the Yum Yum Solar Energy Center would be most apparent and likely more visually intrusive in the morning, when the panels would be upright, approximately 10 feet from the ground at full tilt facing east. However, this effect would be least apparent at mid-day, when the panel profile would be lower (approximately 6-feet-tall when lying flat). Photo 3.5-9 and Photo 3.5-10 present representative views of the type of solar panels proposed for the Project. In the evening, when the panels would be upright facing west, the visual effects would largely occur from Project Area vantage points along and off of SR 222 between Glade Springs Drive and Old 59 Drive and along and near Wagon Wheel Road and western portions of Fowler Drive. However, the substantial mature tree buffers throughout the Project Area and, in particular, along roadways, property lines, and around the perimeter of the Project Site would make these effects from the Project minimal.

Indirect impacts to visual resources in the Project Area may occur due to increased traffic and movement of heavy machinery on the Project Site and along local roads. Overall, there would be minor direct and indirect impacts to visual resources during the construction phase of the Proposed Action. However, these impacts would be temporary (approximately 20 months).

Overall, the visual alteration from agricultural and undeveloped, forested land to a large solar facility in an area where scenic integrity is rated as moderate to high due to the relative unity of the surrounding natural and cultural character is expected to result in minor adverse impacts. Visual impacts during the operation phase of the Project would be minor in the immediate vicinity, due to substantial tree buffers around property boundaries in the Project Area. Visual impacts would be minimal to negligible on a larger scale, due to variation of the visual attributes of the Project Area as distance from the Project increases. If required by Fayette County, the Project would make landscape plantings at the county's discretion surrounding the Project Site as a minimization effort.

Photo 3.5-9. Single-axis, tracking photovoltaic system with panels showing some tilt as viewed from the east or west

Photo 3.5-10. The backside of the single-axis tracking photovoltaic solar panels.

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 No Action and Proposed Action Alternatives.

3.6.1 Affected Environment

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 USEPA and has been adopted by most federal agencies (USEPA 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

such as construction. The A-weighted sound level 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 USEPA as a level below which there is no adverse impact (USEPA 1974). For reference, approximate noise levels (measured in dBA) of common activities/situations are provided in Table 3-6.

Table 3-6. Noise Levels of Common Activities/Situations.

Activity/Event	dBA
Lowest audible sound to person with average hearing	0
Quiet rural, nighttime	25
Quiet urban, nighttime	45
Large business office	60
Normal speech at 3 feet	70
Noisy urban area, daytime	75
Food blender at 3 feet	90
Gas lawn mower at 3 feet	100
Jet flyover at 1000 feet	110

***Source**:* Caltrans 2018.

Noises occurring at night generally produce a greater annoyance than do noises of the same levels occurring during the day. People generally 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 ten dBA lower than those during the day (USEPA 1974).

The Project Site is within an agricultural, rural-residential, and undeveloped area of northern Fayette County. Ambient noise at the Project Site consists mainly of agricultural sounds, such as noises from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. Noise levels of these types generally range from 45 to 55 dBA (USDOT 2015).

The Project Site and a surrounding 0.5-mile radius were examined to identify potential noise-sensitive receptors. Noise-sensitive receptors are defined as those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur. Approximately 177 noise-sensitive receptors are within the area examined (Figure 3-9). Oak Grove Gin and Warehouse and two residences within a rural-residential concentration along SR 222 and Glade Springs Drive to the southeast of the Project Site are between 250 and 415 feet away from proposed PV arrays. Oak Grove Gin, the closest noise-sensitive receptor to proposed Project elements is located approximately 250 feet from the nearest proposed PV array, and is an active agricultural processing complex on approximately 50 acres with normal operating sounds at or above the typical 45 to 55 dBA in the Project Area (Photo 3.5-7; USDOT 2015). A 12.9-acre parcel

of land with plowed fields, an agricultural pond, and several small farm buildings not accounted for in Fayette County tax information is located approximately 310 feet from the nearest proposed PV array. No residences appear to be extant on the property; however, a residence on an adjacent parcel is approximately 530 feet away from a proposed PV array. A 5-acre residential-agricultural complex along SR 222, adjacent to Oak Grove United Methodist Church, is located approximately 540 feet from a proposed PV array. According to the Tennessee Comptroller of the Treasury (2019), the complex consists of one 3,376-square foot, single-family residence and two farm shops, of 2,112 and 4,800 square feet, respectively. Other residential and rural-residential concentrations of noise-sensitive receptors occur to the west of the Project Site, approximately 635 feet from proposed PV array locations; near the central portion of the Project Site, approximately 560 feet or more away from proposed PV arrays; and adjacent to the eastern portion of the Project Site, 475 feet or more away from proposed Project elements.

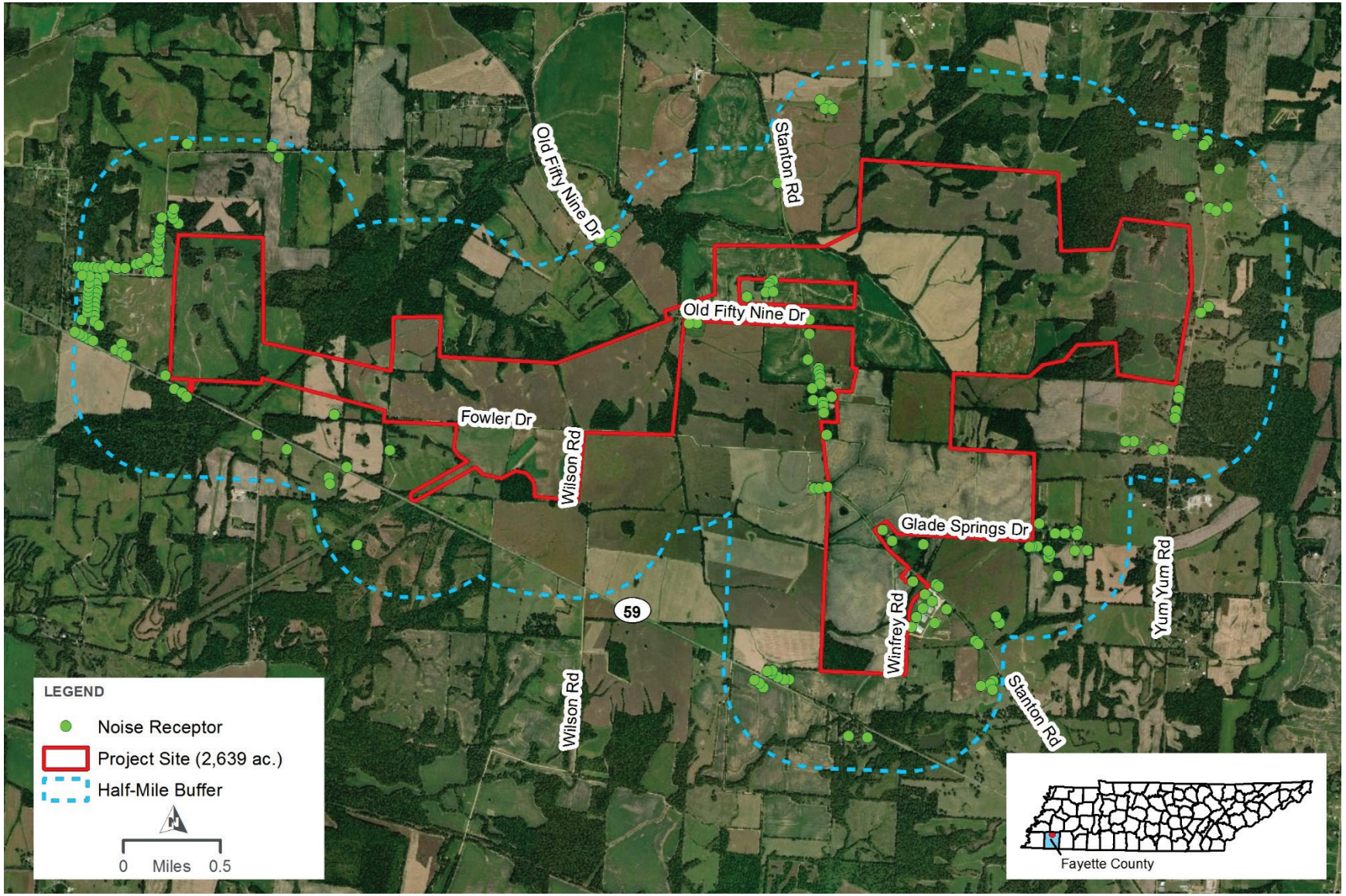

Figure 3-9. Noise-sensitive receptors in the Project Area.

3.6.2 Environmental Consequences

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

3.6.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility 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 agricultural and undeveloped, forested land; therefore, the ambient sound environment would be expected to remain as it is at present.

3.6.2.2 Proposed Action Alternative

Direct and indirect noise impacts associated with implementation of the Proposed Action would primarily occur during construction. Construction equipment produces a range of sounds while operational. Noisy construction equipment, such as delivery trucks, dump trucks, water trucks, service trucks, bulldozers, chain saws, bush hogs, or other large mowers for tree clearing, produce maximum noise levels at 50 feet of approximately 84 to 85 dBA. This type of equipment may be used for approximately 20 months (approximately 600 days) in the Project Area.

Construction noise would cause temporary and minor adverse impacts to the ambient sound environment around the Project Area. The closest noise-sensitive receptor, Oak Grove Gin and Warehouse, is adjacent to the southeastern boundary of the Project Site, approximately 250 feet from the nearest PV array. This active agricultural processing complex would temporarily experience heightened noise during construction, primarily from pile-driving activities. However, when the facility is in operation in the fall and early winter, this facility likely produces ambient sounds that are at or higher than the typical 45 to 55 dBA in the Project Area, and these existing noises would help make effects from the Project more minimal when people are typically present at this facility. Additionally, construction would primarily occur during daylight hours, between sunrise and sunset; therefore, the Project would not affect ambient noise levels at night during most of the construction period. Most of the proposed equipment would not be operating on site for the entire construction period but would be phased in and out according to the progress of the Project.

The activities likely to make the most noise for an extended time period would be pile driving during the construction of the array foundations, which would be completed in approximately six months. Standard construction pile drivers are estimated to produce between 90 to 95 dBA at a distance of 50 feet (USDOT 2011). The piles supporting solar panels are anticipated to be driven into unconsolidated loess; based on current knowledge, rock drilling is not anticipated, but overburden soil thickness will not be confirmed until construction commences. Construction workers would wear appropriate hearing protection in accordance with Occupational Safety and Health Act (OSHA) regulations. Noise-sensitive receptors adjacent to proposed PV arrays and the Yum Yum 161-kV Switching Station and associated 190-foot TL connection would temporarily experience heightened noise primarily during pile driving for the array foundations and pole drilling for the new TL pole structures during daylight hours.

Existing ambient noise in the Project Area generally ranges from 45 to 55 dBA and consists mainly of agricultural sounds, such as noises from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. Since construction would only occur during the day for most of the construction period, at the same time that agricultural activities and more traffic would occur, there would not be a significant difference in noise levels with implementation of the Project other than pile driving activities during construction.

Following completion of construction activities, the ambient sound environment would be expected to return to existing levels or below, by eliminating the seasonal use of agricultural equipment. The moving parts of the PV arrays would be electric-powered and produce little noise. The central inverters would produce noise levels of approximately 65 dBA at 33 feet, and the Project substation would emit approximately 50 dBA at 300 feet. As no noise receptors are within 33 feet of proposed inverter locations or within 300 feet of the Project substation, these effects from the Project are anticipated to be minimal to negligible. The periodic mowing of the Project Site to manage the height of vegetation surrounding the solar panels would produce sound levels comparable to those of agricultural operations in the Project Area; however, Project-related mowing would occur at less frequent quarterly intervals. Consequently, the Proposed Action would have minimal effects on noise levels as a result of normal continuous operation.

Overall, implementation of the Proposed Action would result in minor, temporary adverse impacts to the ambient noise environment in the Project Area during construction, and minimal to negligible impacts during operation and maintenance of the solar facility.

3.7 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

This section describes existing air quality and GHG emissions in the Project Area and the potential impacts on air quality and GHG emissions that would be associated with the No Action and Proposed Action Alternatives.

3.7.1 Affected Environment

Ambient air quality is determined by the type and concentration of pollutants emitted into the atmosphere, the size and topography of the air shed in question, and the prevailing meteorological conditions in that air shed. Through its passage of the Clean Air Act of 1970 (CAA) and its amendments, Congress mandated the protection and enhancement of our nation's air quality. USEPA 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, 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. Areas in compliance with the NAAQS are designated "attainment" areas. Areas in violation of the NAAQS are designated as "nonattainment" areas, and new sources being located in or near these areas may be subject to

more stringent air permitting requirements. Nonattainment areas are usually defined by county. National standards, other than annual standards, may not be exceeded more than once per year (except where noted). Areas that cannot be classified on the basis of available information for a particular pollutant are designated as “unclassifiable” and are treated as attainment areas unless proven otherwise. Finally, areas that were formerly nonattainment for a pollutant and later come into attainment are then categorized as “maintenance” for that pollutant for the next 20 years, assuming they continue to meet the NAAQS for that pollutant. If an area remains in attainment for the 20-year maintenance period, the status reverts back to normal attainment.

3.7.1.1 Regional Air Quality

The Project Area in rural Fayette County has little development in the vicinity apart from that related to rural-residential and agricultural uses. Denser development is approximately ten miles or more to the southwest, where the Memphis suburban area has been expanding in recent years. Fayette County has no air quality monitoring sites listed in USEPA’s national database for NAAQS-regulated pollutants, but it is considered to be in attainment for all NAAQS. There are monitoring sites for some pollutants in adjacent Shelby County (the Memphis area to the west of Fayette County) and all the monitor sites in Shelby County currently indicate compliance with NAAQS. There are currently no NAAQS nonattainment areas in Shelby County; however, parts or all of that county were previously designated as nonattainment for ozone and lead. Those areas came into compliance with those standards and have maintenance plans in place to maintain NAAQS compliance for those pollutants.

With respect to the newest NAAQS, issued in 2015 for 8-hour ozone concentration (70 parts per billion), the entire State of Tennessee was designated as “attainment/unclassifiable” by USEPA on January 16, 2018. The unclassifiable designation means there are not sufficient monitoring data available to prove that there are no nonattainment issues. However, given that monitors in urban areas are showing compliance, rural areas such as Fayette County are also likely in actual compliance with the 2015 ozone NAAQS and are officially treated as in compliance by USEPA.

Table 3-7 presents the most recent USEPA emission inventory data (USEPA 2019b) for the most prevalent NAAQS pollutants for Fayette County. These data represent anthropogenic emissions from all stationary source and mobile source activities. The table also provides a comparison of Fayette County emissions with the more populated and industrialized Shelby County adjacent to the west. The table presents the percentage of Shelby County emissions that Fayette County emissions comprise. The predominantly rural Fayette County has relatively low emissions in comparison to Shelby County and, thus is expected to have generally good air quality.

Table 3-7. Average 2014 emissions of NAAQS pollutants in Fayette County, as compared with Shelby County.

Pollutant	Emissions (tons per year)	Percent of Shelby County Emissions
Carbon Monoxide	9,954	8%
Nitrogen Oxides (NO_x)	2,037	6%
PM_{10} Primary	4,898	39%
$PM_{2.5}$ Primary	1,231	26%
Sulfur Dioxide	35	0.2%
Volatile Organic Compounds (ozone precursor)	1,770	5%

Source: USEPA 2019b

3.7.1.2 Regional Climate

Weather conditions determine the potential for the atmosphere to disperse emissions of air pollutants. Based on climate data from Brownsville, Tennessee, approximately 15 miles northeast of the Project Area, the coldest month is January, with average maximum and minimum temperatures of approximately 47 degrees Fahrenheit (°F) and 29°F, respectively. The warmest month is July, with average maximum and minimum temperatures of approximately 90°F and 71°F, respectively. Precipitation is highest from November through May, and averages 52 inches per year (National Oceanic and Atmospheric Administration 2019a). Average annual snowfall is around five inches per year. On average, approximately 26 tornados occur in Tennessee each year (National Oceanic and Atmospheric Administration 2019b).

Figure 3-10 is a chart of annual average temperatures over the 123-year period of record for Brownsville, Tennessee, based on data from Iowa Environmental Mesonet (IEM 2019). The trend line on the chart, as indicated by the embedded line slope equation, shows little change in average temperature over the period of record, although there appears to be some cyclical variation.

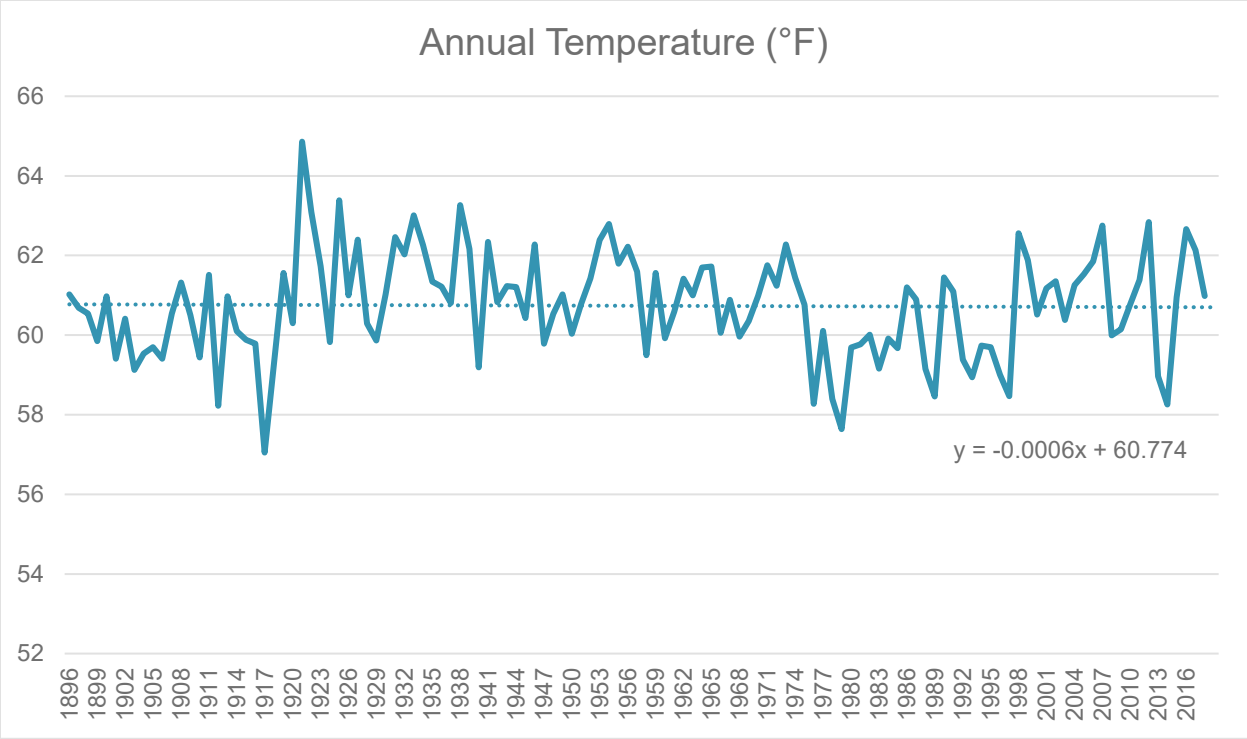

Figure 3-10. Annual Average Temperature for Brownsville, TN over 123-Year Record

3.7.1.3 Greenhouse Gas Emissions

GHGs include natural and man-made compounds that disperse throughout the earth's atmosphere. These compounds absorb a portion of Earth's infrared radiation and reemit some of it back to the ground, thus keeping surface temperatures warmer than they would be otherwise. In this way, GHGs act as insulation and contribute to the maintenance of global temperatures. As the levels of GHGs in the atmosphere increase, the result is an increase in temperature on earth, commonly known as global warming. It is hypothesized that the climate change associated with global warming produces negative economic and social consequences across the globe through changes in weather (e.g., more intense hurricanes, greater risk of forest fires, flooding). However, as shown in Figure 3-10, for the Project Area in western Tennessee, there is currently no noticeable long-term upward trend in temperature.

Apart from water vapor, the primary GHG emitted by human activities in the US is CO_2, representing approximately 82 percent of total GHG emissions in the US (USEPA 2019b). The largest source of CO_2 and of overall GHG emissions is fossil fuel combustion. US emissions of the GHG methane, which have declined from 1990 levels, result primarily from enteric fermentation (digestion) associated with domestic livestock, decomposition of wastes in landfills, coal mining, and leakage of natural gas from petroleum drilling and production activities. Agricultural soil management is the major source of the GHG nitrous oxide emissions in the US, representing approximately 74 percent of its emissions from human activities (USEPA 2019c). GHG emissions from the TVA power system are described in TVA's 2015 IRP (2015a).

3.7.2 Environmental Consequences

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 would not be constructed. Therefore, no Project-related impacts on climate or air quality would result. Existing land use is expected to remain a mix of agricultural fields and forested land, and the existing habitat would be expected to remain as it is at present, with little effect on climate and air quality. The main source of emissions in the Project Area would continue to be from mobile sources such as automobiles and agricultural equipment.

3.7.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to air quality would be anticipated as a result of construction and operation of the Project. Temporary impacts to GHG emissions expected during construction would be negligible.

Regional Air Quality

The majority of potential air quality impacts associated with the Proposed Action would occur during construction. Construction activities would create emissions from the construction equipment and vehicles, contracted employees' personal vehicles, and fugitive dust suspension from clearing, grading, and other activities. Tree debris from clearing would be removed by either burning or chipping and grinding. As burning may occur, this could generate temporary localized air quality impacts due to smoke particles and gases. Any such burning of vegetative debris would be done in accordance with any local ordinances or burn permits, and is not expected to have any health consequences for this sparsely populated rural area.

The use of construction equipment would cause a minor temporary increase in GHG emissions during the construction activities. Combustion of gasoline and diesel fuels by internal combustion engines (haul trucks and off-road- vehicles) would generate local emissions of PM, nitrogen oxides (NO_x), CO, volatile organic compounds (VOCs), and SO_2. The total amount of these emissions would be small and would result in negligible air quality impacts overall.

Approximately 95 percent (by weight) of fugitive emissions from vehicular traffic over paved and unpaved roads would be composed mainly of particles that would be deposited near the roadways, along the routes taken to reach the Project Site. As necessary, fugitive dust emissions from construction areas and paved and unpaved roads would be mitigated using BMPs including wet suppression. Wet suppression can reduce fugitive dust emissions from roadways and unpaved areas by as much as 95 percent. Therefore, direct impacts to air quality associated with construction activities would be expected to be minor.

Regional Climate

No noticeable direct or indirect impacts to the regional climate would be associated with the construction of the proposed Project. Local or regional climate effects can occur, for example, with major changes in land use that affect the hydrological cycle, or that create large impervious surfaces, thus changing the radiative heat balance over a large area. The Project would change the surface characteristics somewhat, but it would have little effect on soil permeability and hydrologic characteristics of the developed area. Vegetation would still grow under and around the solar panels, tending to maintain a landscape with significant evapotranspiration of precipitation, as opposed to creating significant runoff of precipitation that happens with urban development, which can create a “heat island” effect. Therefore, average temperatures of the developed area are not expected to change significantly due to the proposed development.

Greenhouse Gas Emissions

The use of construction equipment would cause a minor temporary increase in GHG emissions during the construction activities. Combustion of gasoline and diesel fuels by internal combustion engines (trucks and offroad- vehicles) at the site would generate emissions of CO_2 and very small amounts or other GHGs such as methane and nitrous oxide. Additional GHG emissions would occur due to transporting materials and workers to the Project location, and GHGs would be emitted in the US or globally for production and transportation of the materials used for construction. The production of construction materials is expected to represent the largest portion of the Project-related GHG emissions. The total GHG emissions due to construction should eventually be offset by Project operation over the long term, assuming that the electricity generated by the Project will offset some fossil-fuel-based electricity generation and associated GHG emissions.

Tree and other tall vegetation removal during construction of the Project would represent a minor loss of potential carbon sequestration. Trees and other tall vegetation currently remove CO_2 from the air and sequester it as biomass. The loss of this carbon sink would constitute a minor adverse direct and indirect impact as sequestration would have continued for the life of the vegetation and long into the future, assuming that other changes on the Project Site did not result in deforestation. The loss of the carbon sink from tree removal would be at least partially offset by the increased sequestration of CO_2 by the permanent grass-dominated vegetation that would be maintained on the solar facility site.

The operation of the Project is not anticipated to have any negative impacts to air quality or GHG emissions. No emissions would be produced by the operation of the solar facility or electrical lines. Minor emissions would occur during maintenance activities, including facility inspections and periodic mowing. Conversely, overall emissions of air pollutants from the TVA power system would decrease during operation as the nearly 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 reduction in GHG emissions resulting from the operation of the solar facility would have little noticeable effect at regional or larger scales. It would, however, be a component of the larger planned system-wide reduction in GHG emissions by the TVA power system. The

adverse impacts of GHG emissions and the beneficial impacts of TVA's reduction in GHG emissions are described in more detail in the TVA IRP (2015a).

3.8 CULTURAL RESOURCES

This section describes an overview of existing cultural resources in the Project Area and the potential impacts on these cultural resources that would be associated with the No Action and Proposed Action Alternatives. Components of cultural resources that are analyzed include archaeological and architectural resources.

3.8.1 Affected Environment

Cultural resources are properties and places that illustrate aspects of prehistory or history or have long-standing cultural associations with established communities and/or social groups. Cultural resources may include archaeological sites, unmodified landscapes and discrete natural features, modified landscapes, human-made objects, structures such as bridges or buildings, and groups of any of these resources, sometimes referred to as districts.

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (54 U.S.C. § 300101 *et seq.*), is specifically designed to address the effects of federal and/or federally funded projects on tangible cultural resources—that is, physically concrete properties—of historic value. The NHPA provided for a national program to support both public and private efforts to identify, evaluate, and protect the nation's important cultural resources. Once identified, these resources are evaluated for inclusion in the NRHP maintained by the National Park Service. Tangible cultural resources may qualify for inclusion in the NRHP if they are 50 years of age or older (unless in exceptional cases) and if found to embody one or more of four different types of values, or criteria, in accordance with 36 CFR § 60.4:

- *Criterion A:* association with events that have made a significant contribution to the broad patterns of our history. Such events may include a specific occurrence or pattern of occurrences, cultural traditions, or historic trends important at a local, regional, or national level. To be considered in association with a cultural resource, events must be important within the particular context being assessed.

- *Criterion B:* association with the lives of persons significant in our past. People considered may be important locally, regionally, or nationally, and the cultural resources considered are limited to properties illustrating a person's achievements rather than commemorating them.

- *Criterion C*: embodiment of the distinctive characteristics of a type, period, or method of construction; representative of the work of a master; possessing high artistic values; or representative of a significant and distinguishable entity whose components may lack individual distinction. Cultural resources considered generally include architectural resources such as buildings, objects, districts, and designed landscapes.

- *Criterion D*: cultural resources that have yielded, or may be likely to yield, information important in prehistory or history. Considered cultural resources typically include

archaeological sites but may also include buildings, structures, and objects if they are the principal source of important information not contained elsewhere.

Cultural resources that are listed or considered eligible for listing in the NRHP are called “historic properties.” Federal agencies are required by the NHPA to consider the possible effects of their undertakings on historic properties and take measures to avoid, minimize, or mitigate any adverse effects. NEPA requires federal agencies to consider how their undertakings may affect the quality of the human environment, including both cultural resources and those defined as historic properties, so that the nation may “preserve important historic, cultural, and natural aspects of our national heritage.” “Undertaking*”* includes 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 § 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 (determining whether the undertaking would affect the qualities that make the property eligible for the NRHP); and
4. Resolution of any adverse effects (by avoidance, minimization, or mitigation).

A project may have effects on a historic property that are not adverse. However, if the agency determines that the undertaking’s effect on a historic property within the APE would diminish any of the qualities that make the property eligible for the National Register (based on the criteria for evaluation at 36 CFR part 60.4), the effect is said to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site, or erecting tall buildings or structures within the Viewshed of a historic building in such a way as to diminish the structure’s integrity of feeling or setting and its ability to convey its historic and/or architectural significance. Adverse effects must be resolved. Resolution may consist of avoidance (such as redesigning a project to avoid impacts or choosing a project alternative that does not result in adverse effects), minimization (such as redesigning a project to lessen the effects or installing visual screenings), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Mitigation of adverse effects to historic buildings and structures sometimes involves thorough documentation of the resource by compiling historic records, studies, and photographs.

Agencies are required to consult with the appropriate state historic preservation officer(s) (SHPOs), federally recognized Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking. Through various regulations and guidelines, federal agencies are encouraged to coordinate Section 106 and NEPA review to improve efficiency and allow for more informed decisions. Under NEPA, impacts to cultural resources that are part of the affected human environment but not necessarily eligible for the NRHP must also

be considered by federal agencies. Generally these considerations as well as those of NRHP-eligible traditional cultural resources (also called traditional cultural properties; see Parker and King 1998) are accomplished through consultation with parties having a vested interest in the undertaking, as described above. THC specifically addresses NHPA and NEPA coordination and suggests agencies initiate Section 106 review early in the planning process.

3.8.1.1 Identification Survey and Field Findings Summary

As part of the evaluation process, a Phase I cultural resources survey was conducted by HDR on the Project Site and vicinity in March and April 2019 to determine the presence of archaeological and architectural cultural resources that are listed or eligible for listing in the NRHP (Johnson and Forbes 2019). The Project Area examined for archaeological resources, referred to herein as the Direct APE, consisted of a 2,650-acre area encompassing the 2,639-acre Project Site. The Project Area for historic-age architectural resources included the 2,650-acre APE and the portions of a 0.5-mile radius surrounding the APE that are visually connected by direct line-of-sight, referred to herein as the Viewshed (Figure 3-11). Areas within the survey radius that were determined not to be within view of the Project due to terrain, vegetation, and/or modern built environments, are not considered part of the Viewshed.

Cultural resources identification consisted of background research and architectural and archaeological field surveys; the associated report provides preliminary NRHP evaluations and a results summary. During the archaeological survey, HDR excavated approximately 2,109 shovel tests and recorded a total of 37 archaeological sites and 39 isolated artifacts within the APE. None of the sites or isolated finds are recommended eligible for listing on the NRHP. During the architectural survey, HDR recorded 92 historic-age architectural resources within the APE and Viewshed. Five of the newly recorded architectural resources are recommended eligible for listing in the NRHP. Two historic-age architectural resources were not visible from the public ROW, and are therefore presumed eligible for listing in the NRHP for the purposes of Section 106. All of the NRHP-eligible resources are located outside the APE but within the Viewshed.

The following section summarizes the historic context from the Phase I cultural resources survey report. The newly identified resources are described more fully in Section 3.8.1.3.

3.8.1.2 Historic Context

The history of Tennessee can be broken into six main periods: the Paleoindian, Archaic, Woodland, Mississippian, Protohistoric, and Historic Periods. These periods and their associated date ranges are summarized in Table 3-8.

Table 3-8. Cultural Historical Sequence for Tennessee.

Period	Age
Paleoindian	11,500–9,900 BP
Archaic	9,900–3,000 BP
Woodland	3,000–1,000 BP
Mississippian	1,000–350 BP
Protohistoric	350 BP–A.D. 1800
Historic	A.D. 1800–1980

Paleoindian Period (11,500 – 9,900 BP)

The first human populations present in Tennessee are believed to have arrived approximately 12,000 YBP, in association with the retreat of the Wisconsin glaciation (Forsberg 2003). These early inhabitants existed as small bands of nomadic hunters and gatherers (Childress and Buchner 1999). Paleoindians were generalized foragers who supplemented their diet of plant foods and small game with occasional opportunistic killings of large fauna, such as a mastodon (Chapman 2009). Their existence is evidenced by artifacts which include fluted and unfluted lanceolate points, such as Clovis and Cumberland, and an assortment of tools, such as snub-nosed scrapers with graver spurs and unifacial scrapers (McNutt et al. 1984; Weaver et al. 1998). Beaver Lake and Quad points are also diagnostic of this era (McNutt et al. 1984; Weaver et al. 1998).

Archaic (9,900 – 3,000 BP)

The Archaic Period is characterized by more stabilized climate conditions, as well as a gradual increase in population (Jefferies 1990). Settlement patterns during this tradition tended to be seasonal occupation with semi-permanent base camps (Ison et al. 1991). Subsistence continued to rely on hunting animals such as white-tailed deer; black bear; a wide variety of other mammals; turkeys; passenger pigeons; migratory waterfowl like ducks and geese; fish such as suckers, drum, and catfish; and the gathering of wild plants (Chapman 2009). Typically, the Archaic tradition is divided into three periods—Early, Middle, and Late—largely based on projectile points. Site characterization can also include temporal, social, subsistence, and settlement criteria (Versluis 2005).

Woodland Period (3,000 – 1,000 BP)

The Woodland Period is broadly characterized by the manufacture of pottery (Chapman 2009). In Tennessee, there were two sources for pottery. The earliest arrived around 3,000 BP and was a fiber or sand-tempered version which was brought north from southern cultures. The second source appeared in eastern Tennessee from the northeast by 2,900 BP, and was identified by large conical containers with cord and fabric marked exteriors (Chapman 2009). The Woodland Period is known for the construction of burial mounds and other earthworks, indicative of a more sedentary way of life and supported by an emphasis on plant cultivation (Railey 1996). Finally, the bow and arrow began to replace the spear and atlatl (Blitz 1988).

Mississippian Period (1,000 – 350 BP)

The Mississippian Period is characterized by the construction of earthen platform mounds on which were erected temples, elite residences, and council buildings. The arrangement of mounds and individual household structures were open to plazas. This period witnessed an increased population and more stable settlements. Along with this way of life came the emergence of organized chiefdoms, increased warfare, elaborate and well-developed religious ceremonialism and symbolism, dependence upon new and improved strains of corn and the introduction of beans, and morphological changes in ceramics and a fluorescence in ceramic styles (Chapman 2009). Settlements began to include large towns in the floodplain areas of major river valleys, villages, and small farmsteads (Chapman 2009). Structures were usually rectilinear wattle and

daub buildings with thatched roofs and included public, sacred, and storage buildings (Smith 1999). The primary crops were beans, maize, and squash (Barker and Kline 2013).

Protohistoric Period and Historic Native American Groups (350 BP – A.D. 1800)

The end of the Mississippian cultural period coincided with the introduction of diseases from the Old World carried into the New World by the Spanish in the middle sixteenth century. Areas of Tennessee became almost entirely abandoned, believed to have been caused by disease, population pressure, and warfare (Barker and Kline 2013). Families—including extended families that remained—tended to live on small farmsteads. Natives initially displaced from the Ohio River Valley migrated to the region. Eventually, by the 1800s, all Native Americans were forcibly removed westward from the area on what would be known as the "Trail of Tears" (Barker and Kline 2013).

American Settlement through the Civil War (1800 – 1865)

For several centuries prior to European-American settlement of the area of Fayette County, much of present-day Western Tennessee and Western Kentucky was part of a hunting area for the Chickasaw people. The Chickasaw established villages in northern Mississippi in the 16th century, and by the late 1700s had developed relationships with European-American traders traveling through the region. As the westward expansion of the U.S. began in the late 18th century, Chickasaw leaders recognized that their claims on the frontier between the U.S. and Mississippi River would inevitably lead to conflict, and in 1818, signed a treaty that effectively sold their lands in Tennessee and Kentucky to the U.S. government. The first groups of American settlers arrived in the area of Fayette County in the early 1820s. Reports of the region's fertile soils drew early settlers to western Tennessee, and many arrived with enslaved laborers on whom the region's agricultural economy would depend for decades.

In 1824, the Tennessee General Assembly established Fayette County, which they named for the Marquis de Lafayette (1757-1834), a French military officer who fought and commanded American troops during the American Revolutionary War. Somerville, southeast of the Project Area, was selected as the county seat, and was named for Lieutenant Robert Somerville, who fought in the Battle of Tohopeka (Horseshoe Bend) in Alabama during the War of 1812 (Morton 2018). The new county quickly drew new residents, and its population increased from approximately 800 residents in 1825 to 8,652 persons by the first federal census of the county in 1830.

Agriculture was the primary economic activity in Fayette County from its founding. Initially, settlers relied on corn and small gardens to subsist. As demand for more marketable crops—specifically cotton and tobacco—increased, those crops became predominant in the county and region. The state's cotton production was concentrated in southwest and south-central Tennessee, and plantation agriculture became more prevalent in the southwest region than elsewhere in the state (Winters 2018). While it was common for white settlers to work small family farms, the large cotton plantations that developed in Fayette County relied on the labor of enslaved African-Americans to operate prior to the Civil War. Of the 8,652 people residing in Fayette County in 1830, a total of 3,193 were enslaved African-Americans; 48 residents were listed as free blacks. By 1840, the

county had more black residents than white, a statistic that remained consistent through the late 20th century (FCSI 1974). With the plantation economy burgeoning, the first cotton gin in Fayette County in opened in 1830, and gins were soon located throughout the county, processing crops from farms and plantations of all sizes (Goodspeed 1887, Morton 2018).

As the agricultural output of the county increased, local interest in establishing a railroad also developed. In 1852, the Memphis and Charleston Railroad (M&C) acquired the state's interest in the Memphis-LaGrange Railroad, and completed the route. Stops along the M&C's main route in Fayette County were LaGrange, Moscow, and LaFayette (renamed Rossville in 1853), and a lateral line extended from Moscow to Somerville. The Memphis & Ohio Railroad (M&O) built a line through the northwest corner of the county, with stops in Gallaway and Clifton in the early 1860s (Johnson 2018, Morton 1989).

Reconstruction through the Great Depression (1866 – 1940)

By the outset of the Civil War, Fayette County had a well-established and thriving agricultural economy. As was common throughout the state, many residents of Fayette County supported and fought for the Confederate States of America. Many farms and plantations throughout Tennessee were affected by neglect, destruction, or a combination of both during the war, and the emancipation of a formerly enslaved workforce combined to require a new paradigm in the operation of farms and plantations.

In the years following the Civil War, large plantations were often subdivided into smaller farms, and tenant farming and sharecropping became the new labor model throughout the south. Under these systems, land owners typically provided land, equipment, and housing to laborers who shared a percentage of the profit earned from the sale of their crops at harvest. Many previously-enslaved African-Americans who remained in the region after emancipation began sharecropping and tenant farming, as did smaller numbers of white farmers.

Twenty years after the war, the county's infrastructure began another period of expansion. Between 1886 and 1888, the Tennessee Midland Railroad completed a route that extended through Oakland, Somerville, and Laconia. The county's public education system also grew during the same period. Prior to the Civil War, several private academies operated throughout Fayette County, but there was not a system of public schools established until 1873, when the first superintendent of schools was elected. The academies operated until 1909, when the county's first Board of Education established county high schools.

Though the cities established along the railroad in Fayette County remained important commercial centers, smaller rural hubs centered on general stores, cotton gins, churches, and school houses that were developed in the surrounding areas. Communities including Yum Yum and Moorman in the Project Area developed at this time, Yum Yum at the general store on John H. Garnett's farm (at which a post office operated from 1887–1905) and Moorman at the site of a cotton gin. Later a church and school opened there as well.

The Great Depression marked a challenging period for tenant farmers, but several of Fayette County's institutions fared relatively well, namely the county's banks, library, and public schools.

However, the county's population suffered in the early years of the Depression. Having reached an all-time high of 31,499 in 1920, the county's population dropped to 28,891 in 1930 (FCSI 1974). That year, over 83 percent of the county's 5,786 farms were tenant farms, but cash tenancy decreased during the Depression, while sharecropping increased (Morton 1989).

Midcentury in Fayette County (1940 – 1980)

In the decades following World War II, Fayette County experienced many challenges to its social and economic institutions, including desegregation and the repercussions of increasingly mechanized agricultural practices. The first mechanical cotton picker arrived in the county in 1947, which began a trend that steadily decreased the number of farmers and field hands needed to cultivate the same amount of the crop. Rural electrification occurred during the early 1940s, after the Chickasaw Electric Cooperative organized in 1940.

During the Civil Rights era, Fayette County drew national attention for controversies related to voting rights and education. The Fayette County Civic and Welfare League organized in 1959 and filed a lawsuit against the county that alleged registered African-American voters had been denied access to the polls in the August 1959 primary. Additionally, a federal lawsuit against the Fayette County Board of Education was filed in 1965, after which the county's schools were desegregated between 1965 and 1966.

On the economic front, industrial operations became more numerous and diversified in Fayette County during the mid-twentieth century. By the late 1980s, 32 manufacturing companies had plants in Fayette County, and seven towns had large industrial sites (Morton 1989). Construction of Fayette County's first general hospital and first regulation airport occurred in the early 1970s. I-40 was completed through west Tennessee in the 1960s, its route making a northeast trajectory from Memphis through Fayette County.

Despite the new industrial activity, agriculture remained central to the Fayette County economy, with farm income totaling $27 million in 1973, and industrial payroll exceeding $10 million (FCSI 1974). Cotton cultivation continued throughout the 1900s, but the agricultural landscape diversified as additional crops and products including soybeans, cattle, and poultry became increasingly important to the economy. Throughout the changes of the 1970s, agriculture remained the lynchpin of the county's economy, and Fayette County's gross income from agriculture was second in the state in 1982.

3.8.1.3 Known Cultural Resources

HDR conducted a search of the archaeological and architectural records maintained by the Tennessee Division of Archaeology (TDOA) and THC to determine the presence of recorded cultural resources within a one-mile radius of the Project Site, herein referred to as the research radius. Research at TDOA and THC was conducted by HDR on January 23-24, 2019.

A search of TDOA records revealed no previously recorded archaeological sites on the Project Site and one archaeological site (40FY26) located approximately one mile south of the Project Site. Site 40FY26 is a Woodland Period open habitation site located on a bluff above the Loosahatchie River Bottoms. Items recovered at the site consist of a sand-tempered ceramic sherd and a stone artifact.

A search of THC records revealed no previously recorded historical structures or NRHP eligible or listed properties within the APE or the one-mile research radius. In addition, there were no pending or in-process NRHP records for the APE or Viewshed or the one-mile research radius, per the NRHP coordinator for THC.

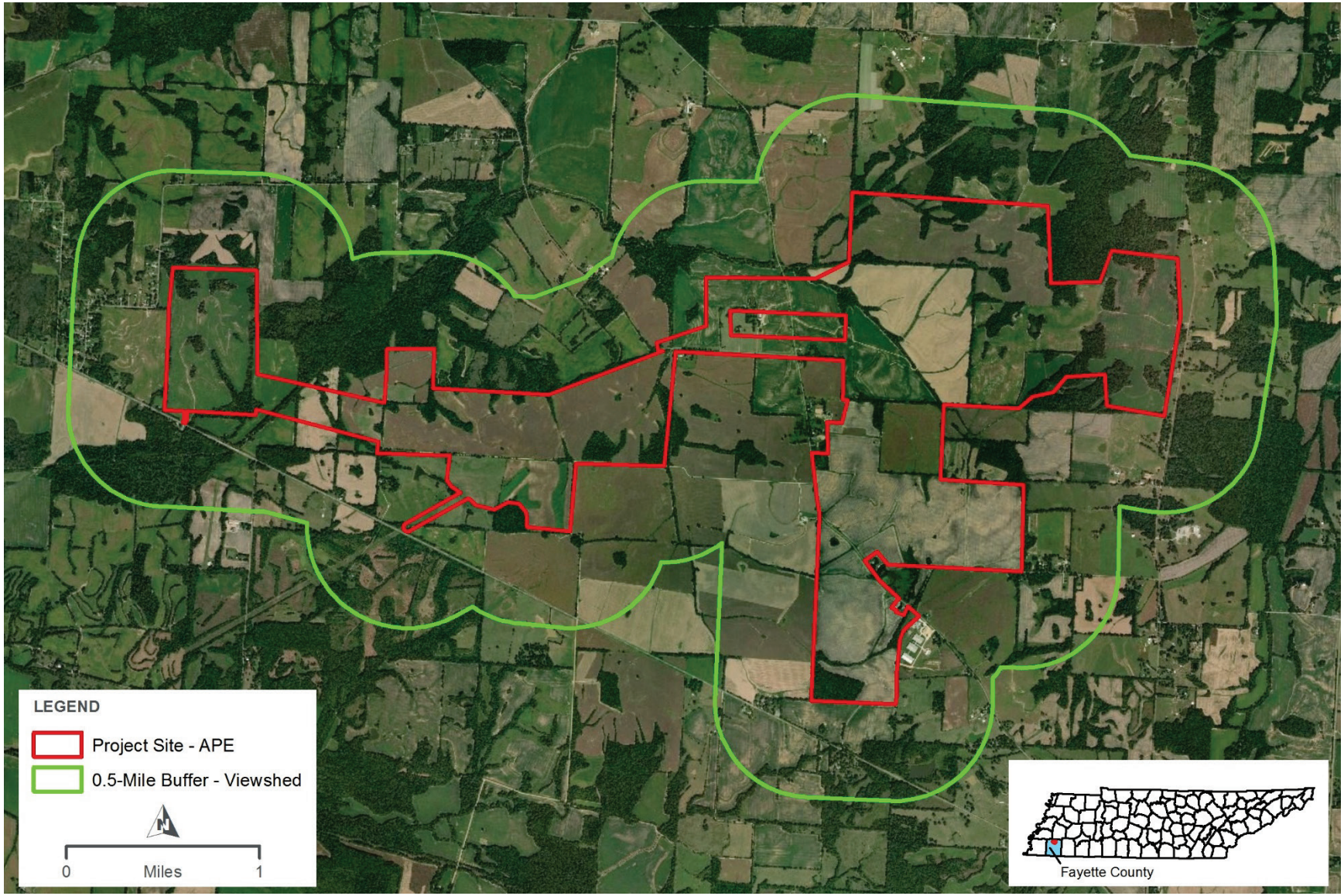

Figure 3-11. Area of potential effect to cultural resources and viewshed for the Yum Yum Solar Energy Center.

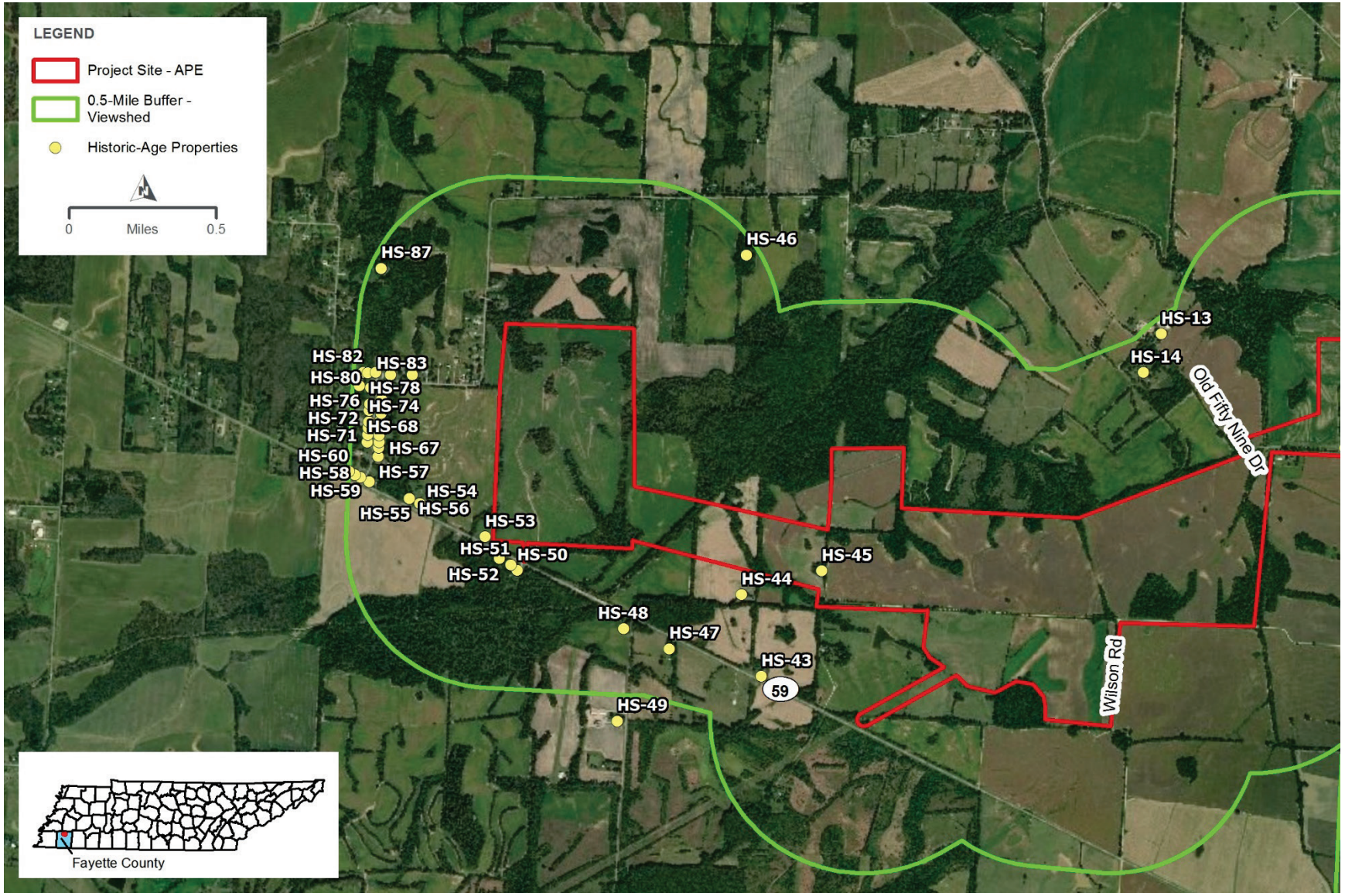

Figure 3-12 West. Location of newly recorded architectural resources within the Yum Yum Solar Energy Center area of potential effect and viewshed.

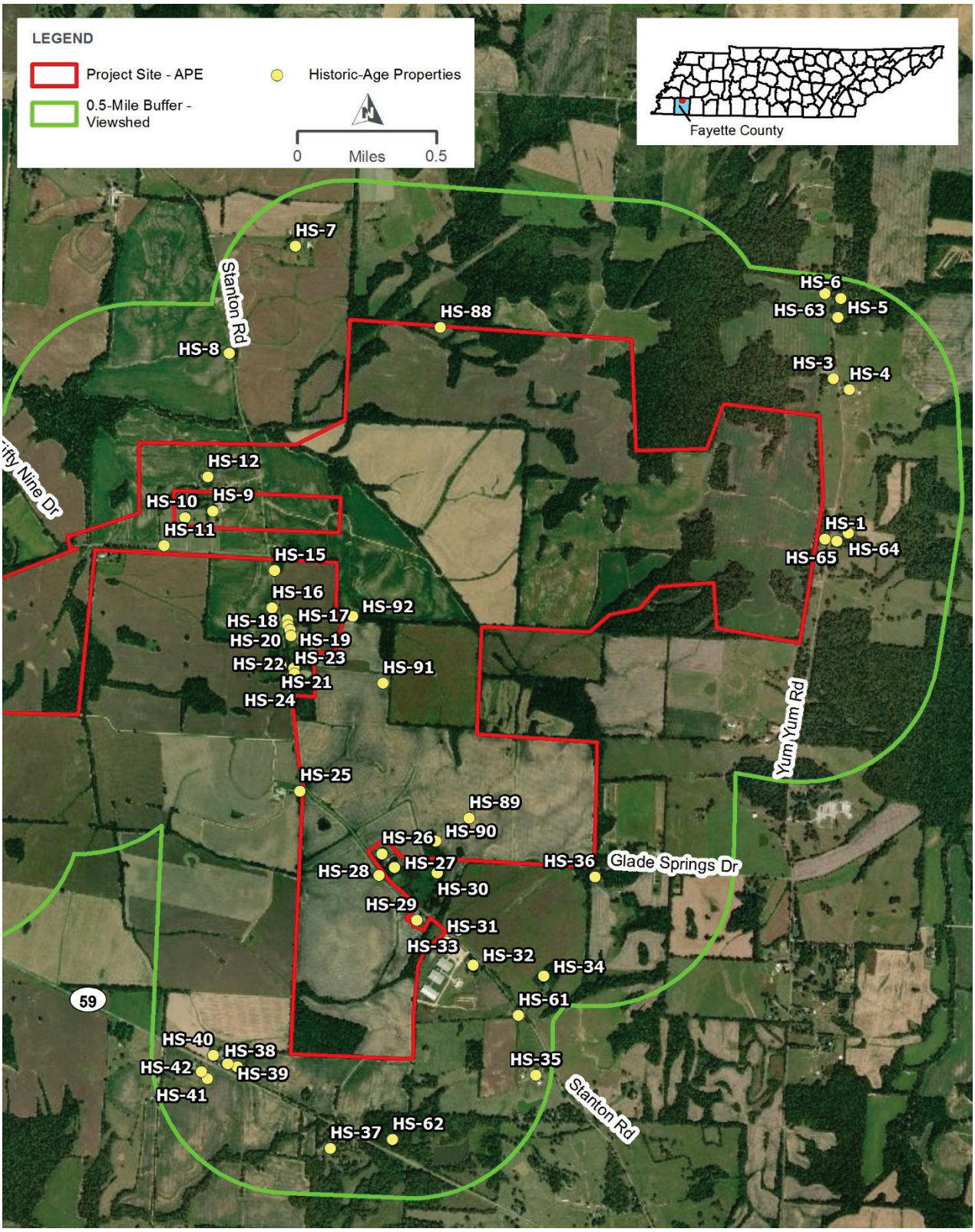

Figure 3-12 East. Location of newly recorded architectural resources within the Yum Yum Solar Energy Center areas of potential effect and viewshed.

During the archaeological survey, the entire APE was assessed via pedestrian walk-over and shovel testing. A total of 37 archaeological sites were recorded within the APE (Table 3-9). Additionally, 39 isolated individual artifacts were recorded within the APE. The TDOA does not define an archaeological site as a particular quantity of artifacts or a minimum site area; instead, it evaluates each find separately. Due to their lack of integrity and limited data potential, these sites are unlikely to provide new knowledge about the prehistory or history of Fayette County.

Preliminarily, HDR recommends all of the sites as not eligible for the NRHP, and no further work is recommended at these sites prior to implementation of the Project. Based on this survey, TVA determined that no NRHP-listed or -eligible archaeological sites are within the APE.

Table 3-9. Newly Recorded Archaeological Sites with the Direct APE

Field ID	Cultural Affiliation	Site Type	NRHP Recommendation
40FY496	Historic	Surface scatter	Not Eligible
40FY497	Historic	Surface scatter	Not Eligible
40FY498	Historic	Surface scatter	Not Eligible
40FY499	Historic	Surface scatter	Not Eligible
40FY500	Historic	Surface scatter	Not Eligible
40FY501	Historic	Structures and associated artifact scatter	Not Eligible
40FY502	Historic	Surface scatter	Not Eligible
40FY504	Historic	Surface scatter	Not Eligible
40FY505	Historic	Surface scatter	Not Eligible
40FY506	Prehistoric / Historic	Surface scatter	Not Eligible
40FY507	Historic	Surface scatter	Not Eligible
40FY508	Historic	Demolished structure and associated artifact scatter	Not Eligible
40FY509	Historic	Surface scatter	Not Eligible
40FY510	Prehistoric / Historic	Surface scatter	Not Eligible
40FY511	Historic	Surface scatter	Not Eligible
40FY512	Historic	Surface scatter	Not Eligible
40FY513	Historic	Surface scatter	Not Eligible
40FY514	Prehistoric / Historic	Surface scatter	Not Eligible
40FY515	Prehistoric / Historic	Surface scatter	Not Eligible
40FY516	Historic	Surface scatter	Not Eligible
40FY517	Historic	Surface scatter	Not Eligible
40FY518	Historic	Surface scatter	Not Eligible
40FY519	Historic	Surface scatter	Not Eligible
40FY520	Historic	Surface scatter	Not Eligible
40FY521	Historic	Surface scatter	Not Eligible
40FY522	Historic	Structures and associated artifact scatter	Not Eligible
40FY523	Historic	Surface scatter	Not Eligible

Field ID	Cultural Affiliation	Site Type	NRHP Recommendation
40FY524	Historic	Surface scatter	Not Eligible
40FY525	Prehistoric / Historic	Surface scatter	Not Eligible
40FY526	Historic	Surface scatter	Not Eligible
40FY527	Historic	Surface scatter	Not Eligible
40FY528	Historic	Structure and associated artifact scatter	Not Eligible
40FY529	Prehistoric / Historic	Surface scatter	Not Eligible
40FY530	Historic	Surface scatter	Not Eligible
40FY531	Historic	Surface scatter	Not Eligible
40FY532	Historic	Structure and associated artifact scatter	Not Eligible
40FY533	Historic	Surface scatter	Not Eligible

During the architectural survey, HDR recorded 91 historic-age residential, agricultural, educational, and religious properties within the APE and Viewshed. Among the newly-recorded resources are five cemeteries, two vacant school buildings, and one church. Two Tennessee Century Farms, a designation by the Tennessee Department of Agriculture that recognizes farms within the same family for at least 100 years (Tennessee Century Farms 2019), are located within the Viewshed: Chestnut Hill, at the southeast edge of the study area, and the Harvey Hill Farm, located at the north-central edge of the study area. A total of 77 of the recorded historic-age resources are domestic/residential properties. A small number of the residential properties recorded are part of farmsteads, but many are situated on comparatively smaller parcels with exclusively residential use. Several concentrations of residences constructed in the early 1970s are located along Highway 59 and Highway 222 (Stanton Road). A small number of historic-age houses dating to the late nineteenth and early twentieth centuries were also recorded, most of which are now vacant and deteriorating.

Six newly-recorded historic-age properties, none of which are considered eligible for the NRHP, are located within the APE. These consist of an abandoned farmstead on Fowler Road (Parcel #044 025.00), an abandoned tenant house and two associated outbuildings east of Highway 222 (Parcel #034 006.00 and 034 008.00), an abandoned sharecropper house (Parcel #045 010.00) and an abandoned tenant house, a collapsed house, and the Watkins Cemetery on the Winfrey Marital Trust property north of Glade Springs Road (Parcel #045 017.00) (Table 3-10; Figure 3-12 West and Figure 3-12 East). The remaining 86 properties documented during the field survey are located in the Viewshed.

Table 3-10. Newly Recorded Historic-Age Architectural Resources within the Direct APE.

Field ID	Parcel #	Structure Type	NRHP Recommendation
HS-45	044 025.00	Abandoned farmstead	Not eligible
HS-88	034 006.00/ 034 008.00	Abandoned tenant house and two associated outbuildings	Not eligible
HS-90	045 017.00	Abandoned tenant house	Not eligible
HS-91	045 017.00	Collapsed house	Not eligible
HS-92	045 010.00	Abandoned sharecropper residence	Not eligible
HS-89	045 017.00	Watkins Cemetery	Not eligible

Upon preliminary assessment, five properties (HS-1, HS-9, HS-27, HS-32, and HS-37) in the Viewshed were found to have historical and/or architectural significance and retain enough integrity to be recommended eligible for listing in the NRHP (Table 3-11 and Figure 3-12). The Pleasant Grove School (HS-1), a Rosenwald School built in 1922, is recommended eligible at the local level under Criterion A for its association with African-American education and the Rosenwald Fund. The core of the Fowler Farmstead (HS-9) on Old 59 Drive, comprising a residence built in 1908 and four associated domestic outbuildings, is recommended eligible at the local level under Criterion C for its architectural significance as an early 20th century farm house with Craftsman and Colonial Revival influences. The Oak Grove United Methodist Church (HS-27) at 1900 Highway 222 has significance under Criterion C as an example of a rural, mid-20th century church building in Fayette County that exhibits a limited expression of the Colonial Revival style. The church serves as a strong example of its type in a rural community in Fayette County and is recommended eligible at the local level. The dwelling (HS-32) at Oak Grove Gin on Highway 222, built in 1910, is recommended eligible under Criterion C as an example of the Queen Ann and Colonial Revival styles applied to a rural dwelling. The building is recommended eligible at the local level. Chestnut Hill (HS-37) at 11580 Highway 59 is significant under Criterion A in the areas of Agriculture and Exploration/Settlement. The property also has architectural significance under Criterion C as an early-19th century farmstead, and is recommended eligible at the local level.

The residential property at 1230 Highway 222 (HS-34) and Patterson Cemetery (HS-87) were not visible from the public ROW, and are therefore presumed eligible for listing in the NRHP for the purposes of Section 106.

Table 3-11. Historic-Age Properties Recommended Eligible for the NRHP.

Field ID	Parcel #	Address/Location	NRHP Recommendation
HS-1	046 002.00	Pleasant Grove School	Eligible
HS-9	056 007.00	Fowler farmstead on Old 59 Drive	Eligible
HS-27	045 018.00	Oak Grove United Methodist Church at 1900 Highway 222	Eligible
HS-32	056 009.00	1910 dwelling at Oak Grove Gin	Eligible
HS-34	056 011.02	Residential property at 1230 Highway 222	Presumed Eligible
HS-37	056 007.00	Chestnut Hill at 11580 Highway 59	Eligible
HS-87	035 032.00	Patterson Cemetery	Presumed Eligible

3.8.2 Environmental Consequences

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

3.8.2.1 No Action Alternative

Under the No Action Alternative, no Project related impacts to cultural resources would occur. The landscape in the Project Area would remain relatively unchanged from the present mix of agricultural fields and forested land.

3.8.2.2 Proposed Action Alternative

Following the archaeological survey of the APE, HDR recommended the 89 newly-identified archaeological sites or isolated finds be considered not eligible for the NRHP. Due to the lack of research potential, HDR recommended no further investigation of these archaeological resources in connection with the Proposed Action. TVA is consulting with the THC (the Tennessee SHPO) and federally recognized Indian tribes with an interest in the region regarding TVA's eligibility determinations and finding that no archaeological resources would be effected.

Following architectural survey of the APE and Viewshed, HDR recommended that, of the 91 historic-age properties previously or newly recorded, five properties (HS-1, HS-9, HS-27, HS-32, and HS-37) in the Viewshed have historical and/or architectural significance and retain enough integrity to be recommended eligible for listing in the NRHP. Two historic-age resources (HS-34 and HS-87) were not visible from the public ROW, and are therefore presumed eligible for listing in the NRHP for the purposes of Section 106.

HS-1, the former Pleasant Grove School building, constructed in 1922, is recommended eligible for listing in the NRHP under Criteria A at the local level of significance for its association with African-American education and the Rosenwald Fund. Under the proposed action, Project activity in the vicinity of the former Pleasant Grove School building (HS-1) would consist of the construction of solar arrays approximately 0.06 miles (295.77 feet) to the west of the building. The proposed tree clearing limits around the arrays would preserve a thin vegetative buffer that is located between the school property and the proposed site of the arrays. The vegetative buffer screens the view of the agricultural fields to the west, but the array would be partially visible from

the west elevation of the building looking to the southwest. The presence of the proposed solar array would not impact the location, materials, feeling, and association of the former school building, the aspects of integrity most important for a resource significant under Criterion A to maintain (NPS 1997). The potential visual impact could affect the building's integrity of setting, however, which is also relevant for properties significant under Criterion A. The proposed solar arrays would introduce an element to the surrounding landscape that would be inconsistent with the building's historically rural setting. However, the building's setting will be minimally impacted—the historic views of the school from Yum Yum Road will remain as they have historically been, and the array would not be visible from the road due to the rise in topography between the road and building, accompanied with the vegetative buffer. The rural feeling and setting will not be impacted to an extent to render the building no longer eligible for NRHP listing. HDR recommends that the Project would not diminish the overall integrity of the Pleasant Grove School or impact the property's ability to covey its historic significance, and would, therefore, have no adverse effect on HS-1.

Project activity in the vicinity of the Fowler Farmstead (HS-9), composed of a residence built in 1908 and four associated domestic outbuildings, would consist of the construction of solar arrays to the east of the property, across Highway 222. The distance between the eastern boundary of HS-9 and the western boundary of the proposed solar arrays would be approximately 0.6 mile (3,155 feet) to the northeast, 0.53 mile (2,777 feet) to the east, and 0.51 mile (2,686.67 feet) to the southeast of HS-09. The proposed tree clearing limits around the arrays would leave a vegetative buffer along a creek between Highway 222 and the proposed site of the arrays. The visual impact of the proposed solar arrays to east of HS-9 would be minimal due to the distance and gently rolling topography between the historic property and the proposed solar arrays, and the presence of mature trees and dense vegetation bordering the creek, parcel lines, and portions of Highway 222 between the two areas. The presence of the proposed solar array would not impact the design, workmanship, and materials of the farmhouse or its associated outbuildings, the aspects of integrity most important for a resource significant under Criterion C to maintain (NPS 1997). HDR recommends that the Project would not diminish the overall integrity of the Fowler Farmstead or impact the property's ability to covey its architectural significance, and would, therefore, have no adverse effect on HS-9.

Project activity in the vicinity of the Oak Grove United Methodist Church (HS-27) would consist of the construction of solar arrays approximately 0.25 mile (1,320 feet) to the southwest of the church, in an agricultural field west of Highway 222 (Stanton Road), and an array in a field approximately 0.25 mile to the north. Due to the setback of the historic property from the east side of Highway 222, the distance and gently rolling topography between the historic property and the proposed solar array to the southwest, and the presence of mature trees and dense vegetation along the west side of Highway 222, which currently obscures the view of the proposed arrays, visual impacts to HS-27 would be minimal or nonexistent. Similarly, mature trees and dense vegetation surrounding the church currently obscure the view of the fields to the east and north (a large outbuilding to the north further restricts the view), and the visual impact of the array to the north would be minimal to nonexistent. As such, the Project would not impact the design, workmanship, and materials of the historic property, the aspects of integrity most important for a resource significant under Criterion C to maintain (NPS 1997). HDR recommends that the Project

would not diminish the overall integrity of the Oak Grove United Methodist Church building or impact the property's ability to covey its architectural significance, and would, therefore, have no adverse effect on HS-27.

Project activity in the vicinity of the dwelling at Oak Grove Gin (HS-32) would consist of the construction of solar arrays approximately 0.35 mile (1,848 feet) to the southwest of the building, in an agricultural field west of Winfrey Road. A set of solar arrays is also proposed approximately 0.6 mile (3,168 feet) to the north of the residence, in an agricultural field on the north side of Glade Springs Drive. Warehouses associated with the Oak Grove Gin are located south and southwest of the dwelling, and mature trees border the parcel line to the south of the gin, and the east side of Winfrey Road. Due to the distance and gently rolling topography between the historic property and the location of proposed solar arrays to the southwest, and the presence of buildings, mature trees and dense vegetation that currently obscure the view of the proposed site to the southwest, visual impacts to HS-32 are not anticipated. Similarly, the distance and topography between HS-32 and the site north of Glade Springs Drive, and presence of vegetation on the north and south sides of Glade Springs Drive also provide a visual buffer that would minimize potential visual impacts, or render them nonexistent. The proposed solar arrays would not impact the design, workmanship, and materials of the historic property, the aspects of integrity most important for a resource significant under Criterion C to maintain (NPS 1997). HDR recommends that the Project would not diminish the overall integrity of the 1910 dwelling at the Oak Grove Gin or impact the property's ability to convey its architectural significance, and would, therefore, have no adverse effect on HS-32.

Project activity in the vicinity of the residential property at 1230 Highway 222 (HS-34) would consist of the construction of solar arrays approximately 0.44 mile (2,315 feet) to the north of the property, in an agricultural field north of Glade Springs Drive. Additional proposed array sites in the vicinity are located west of Winfrey Road, approximately 0.51 mile (2,694 feet) southwest of HS-34. Mature vegetation immediately north of the property, as well as vegetation on the south side of Glade Springs Drive, obscures the view of the proposed array site to the north. Similarly, the property's shelterbelt, and vegetation lining Highway 222 and Winfrey Road, as well as mature vegetation in intervening agricultural fields, obstructs the view of the proposed array site to the southwest. Due to the distance and gently rolling topography between the historic property and the proposed solar arrays, and the presence of mature trees and dense vegetation between the two points, visual impacts to HS-34 would be minimal or nonexistent, and would not alter the overall historic viewshed or rural setting of the property. As such, the proposed solar arrays would not impact the integrity of the property to an extent to render the property no longer eligible for NRHP listing. HDR recommends that the Project would not diminish the overall integrity of HS-34 or impact the property's ability to covey its historic and architectural significance, and would, therefore, have no adverse effect on HS-34.

Project activity in the vicinity of Chestnut Hill (HS-37) would consist of the construction of solar arrays approximately 0.4 mile (2,112 feet) to the north of the farmstead, in an agricultural field north of Winfrey Road. Due to the setback of the historic property from the south side of Highway 59, the distance and gently rolling topography between the historic property and the proposed solar arrays, and the presence of mature trees and dense vegetation along both sides of Highway

59, which currently obscures the view of the proposed site of the arrays, visual impacts to HS-37 would be minimal or nonexistent, and would not alter the overall historic viewshed or rural setting of the Chestnut Hill farmstead. As such, the proposed solar arrays would not impact the design, workmanship, and materials of the historic property, the aspects of integrity most important for a resource significant under Criterion C to maintain. Nor would the proposed solar arrays impact the farmstead's integrity of location, setting, feeling, or association which NRHP guidance advises are important for properties eligible under Criterion A to maintain (NPS 1997). HDR recommends that the Project would not diminish the overall integrity of the Chestnut Hill farmstead or impact the property's ability to convey its historic and architectural significance, and would, therefore, have no adverse effect on HS-37.

Project activity in the vicinity of the Patterson Cemetery (HS-87) would consist of the construction of solar arrays approximately 0.70 miles (3,705 feet) to the southeast of the cemetery, in an agricultural field south of Wagon Wheel Drive. Mature vegetation immediately north of the property, as well as vegetation on the south side of Glade Springs Drive, obscures the view of the proposed array site to the north. Due to the distance between the historic property and the proposed solar arrays, and the presence of mature trees, dense vegetation, and buildings (dwellings along Wagon Wheel Drive) between the two points, visual impacts to HS-87 would be minimal or nonexistent, and would not alter the overall historic viewshed or setting of the property. As such, the proposed solar arrays would not impact the integrity of the property to an extent to render the property no longer eligible for NRHP listing. HDR recommends that the Project would not diminish the overall integrity of HS-87 or impact the property's ability to covey its historic and architectural significance, and would, therefore, have no adverse effect on HS-87.

Though the Watkins Cemetery (HS-89) is not recommended eligible for listing in the NRHP, due to the fact that the cemetery is located in a section of the Project where solar panels may be erected, there is a potential for the Project to disturb gravesites within the cemetery. In order to avoid this potential impact, HDR recommends avoidance of the resource in accordance with the Tennessee Code Annotated §§ 46-8-103, and coordination with THC to determine an appropriate construction buffer around the current boundary of the cemetery

Based on these recommendations on effects and avoidance and minimization measures, TVA determined that the Project would have no adverse effect on these resources. TVA is consulting with the Tennessee SHPO and federally recognized Indian tribes regarding these findings and agency determinations (Appendix F).

3.9 UTILITIES

This section describes an overview of existing utilities within the Project Area and the potential impacts on these utilities that would be associated with the No Action and Proposed Action Alternatives. Specific utility components analyzed below include telecommunications, electricity, natural gas, water, and sewer.

3.9.1 Affected Environment

The Project Site is located in a rural, unincorporated area of northern Fayette County, Tennessee, two miles or more from incorporated municipality limits.

3.9.1.1 Telecommunications

Fayette County is within the Memphis metropolitan calling area (State of Tennessee 2019a), and telecommunication services in the Project Area are provided by AT&T Tennessee (Tennessee Telecommunications Association 2019) as well as mobile providers.

3.9.1.2 Electricity

In the Project Area, electrical service is provided by Chickasaw Electric Cooperative through TVA (CEC 2019; TVA 2019c). Existing power lines are present in the Project Area along portions of SR 76, SR 59, SR 222, and other major and minor roads in the vicinity (CEC 2019). TVA's Cordova-South Jackson 161-kV TL traverses the central portion of the Project Site in a northeast-southwest orientation. A second TL extends across the Project Site in the same general direction.

3.9.1.3 Natural Gas

In most areas of Fayette County north of US 64 and outside of the incorporated limits of Gallaway, natural gas is provided by Somerville Gas and Water through ANR Pipeline Company (Fayette County Chamber of Commerce 2016; Town of Somerville 2019). ANR Pipeline maintains the Brownsville Southbound natural gas pipeline traversing northeast-southwest through the Project Site (ANR Pipeline 2009). However, no natural gas lines or line markers servicing individual customers were observed on the Project Site. Given their proximity to Somerville, the residences located adjacent to the eastern and southern portions of the Project Site may have natural gas service.

3.9.1.4 Water Sewer

Due to being outside of incorporated municipality limits, water service in the Project Area is provided through private wells, and sewer service is provided by private septic systems (Fayette County Chamber of Commerce 2016).

3.9.2 Environmental Consequences

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

3.9.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility 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 agricultural and forested land, and existing on-site utilities would likely remain unchanged, with the exception of potential upgrades and maintenance.

3.9.2.2 Proposed Action Alternative

Under the Proposed Action, installation of the following utility lines would occur: approximately 190 feet of new TL connecting the Yum Yum Solar Energy Center to the Cordova-South Jackson 161-kV TL; approximately 0.9 mile of new overhead fiber-optic ground wire on the existing Cordova-South Jackson 16-kV TL; and telecommunications connections at the Cordova 500-kV

Substation and South Jackson 161-kV Substation, southwest and northeast of the Project Site, respectively, as discussed in Section 2.2.

Electrical service would be provided by Chickasaw Electric Cooperative to the Yum Yum Solar Energy Center, and Chickasaw Electric Cooperative would coordinate with customers if outages are necessary. No other utility services would be required to construct and operate the Project.

Due to the installation of utility lines, there may be short-term adverse impacts to local utilities such as electricity connections when bringing the solar facility on-line or during routine maintenance of the facility. No long-term adverse impacts are expected to be associated with the Project. Implementation of the Proposed Action would result in additional renewable energy resources in the region and would, thus, constitute a beneficial impact to electrical services across the region.

3.10 WASTE MANAGEMENT

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

3.10.1 Affected Environment

"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 or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or is listed as a hazardous waste under 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.

An American Society for Testing and Materials (ASTM) standard E 1527-13 Phase I Environmental Site Assessment (ESA) was performed on February 4, 5, and 6, 2019, to evaluate the presence, former use, or spillage of hazardous substances or petroleum products, also referred to as recognized environmental conditions (RECs), on the entirety of the 25 individual tracts totaling nearly 4,003 acres that encompass the Project Site (HDR 2019b). As part of the Phase I ESA, HDR contracted Environmental Data Resources, Inc. (EDR) to search federal, state, local, and tribal databases for pertinent environmental records related to the Project Site or within standard ASTM E 1527-13 search distances of the Project Site. EDR also searched proprietary databases not required by ASTM E 1527-13 in order to assist the assessor with historical data.

Historically, the Project Site and vicinity have consisted of agricultural land interspersed with undeveloped forested areas since the early 1950s, but likely earlier, based on historical trends

(USGS 2019a and 2019b). Six unique properties were documented in the EDR database report as having the potential for adverse environmental conditions, and the mapped locations of these properties were visited during the field investigations. Additionally, one operational cotton gin (Oak Grove Gin and Warehouse), multiple uncontrolled waste piles, multiple active and inactive above ground storage tanks (ASTs), and multiple underground storage tanks (USTs) were identified within the Project Site during the field reconnaissance.

Based on the EDR report and field reconnaissance, HDR evaluated the following properties in the Project Area as potential RECs:

- **310 Old 59 Drive** is an agricultural field owned by Fowler Properties LLC. This address is listed as having two USTs, one of which is listed as a leaking UST. EDR documents the UST as permanently out of use and the leaking UST as a completed tank closure. Site reconnaissance did not reveal any environmental impacts due to either storage tank.
- **2000 SR 222** is a residential property with an agricultural building approximately 150 feet long. EDR lists this property as having a UST. The UST was removed in 1992, and no leaks were reported. Abandoned vehicles and farm equipment, and multiple empty ASTs ranging in capacity from 500 to 10,000 gallons were observed on the property during the field reconnaissance.
- **1605 Highway 222** is the location of the Oak Grove Gin and Warehouse, an operational cotton gin and storage facility. One 1,000 gallon waste oil AST and one 10,000 gallon fuel AST, were located within a cinder block wall enclosure with a soil floor. Multiple drums, buckets, and bulk containers labeled as containing fertilizer, herbicide, and waste oil were located near the ASTs. Soil staining was observed in this area.
- **3755 Yum Yum Road** is the location of Pleasant Grove Missionary Baptist Church and two associated cemeteries. The current church building was constructed in 1964. This site is listed by EDR as a historical automotive service station; however review of historic aerial photographs did not indicate the presence of a service station on this property. Further, no indication of the historical service station or associated environmental impacts were observed during the field reconnaissance.
- **Uncontrolled dump sites** were located in multiple locations in the Project Area. These dump sites were typically located near main roads and along tree lines. Contents included tires, empty oil containers, broken farm equipment, and household refuse (e.g., washer/dryers, trash bags, cans, and household electronics).

Upon evaluation, HDR found that these locations do not constitute RECs and are not of potential concern for the Project due to such factors as distance, hydraulic gradient, geology or clean-up status. From the Phase I ESA field reconnaissance, HDR additionally noted that many of the agricultural fields are equipped with central pivot irrigation systems. These systems typically have

dedicated wells, fuel ASTs, pumps, and control boxes. Most of the ASTs and pumps are staged on concrete pads. In a few instances, HDR observed *de minimis* staining on the concrete pad or ground surface below ASTs. Based on the length of time the Project Site has been farmed, TVA considers there to be potential for herbicide and/or pesticide residues in the soil. Historical agricultural use is considered a *de minimis* condition, which ASTM defines as a condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. ASTM-defined *de minimis* conditions are not RECs. Overall, HDR concluded that no known RECs are associated with the Project Site.

Collection and disposal of solid waste outside of incorporated municipalities in Fayette County is conducted by private trash collecting companies (Fayette County Chamber of Commerce 2019). Nonhazardous wastes, including construction wastes, can be hauled to an operating Class I facility. Various vendors offer hazardous waste removal.

3.10.2 Environmental Consequences

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

3.10.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility 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 agricultural and undeveloped land, and existing waste management conditions would be expected to remain as they are at present.

3.10.2.2 Proposed Action Alternative

Under the Proposed Action, storage and use of liquid materials in the form of petroleum-based oils and fuels, and generation of liquid and solid wastes in the form of used oil, construction debris, packing materials, and general construction waste would occur.

Materials Management

During construction of the proposed solar facility, materials would be stored on site in storage tanks, vessels, or other appropriate containers specifically designed for the characteristics of these materials. The storage facilities would include secondary containment in case of tank or vessel failure. Construction and decommissioning-related materials stored on site would primarily be liquids such as used oil, nitrogen, diesel fuel, gasoline, hydraulic fluid, and other lubricants associated with construction equipment. Safety Data Sheets for all 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 on-site laydown areas for refueling. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on all refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. A fuel truck may be stored on site for approximately 20 months

during construction of the Project. The total volume of the on-site tanks would exceed 1,320 gallons, the threshold above which a Spill Prevention, Countermeasure and Control (SPCC) plan may be required (40 CFR part 112). The facility would fall under USEPA's SPCC requirements for "oil-filled operational equipment" and a Tier I Qualified Facility; therefore, no double-walled protection would be required, and the SPCC plan would not have to be certified by a Professional Engineer (USEPA 2006 and 2011b). The SPCC plan would be prepared prior to construction to prevent oil discharges during facility operation.

During operation, bulk chemicals would be stored in storage tanks; other chemicals would be stored in returnable delivery containers. Chemical storage areas would be designed to contain leaks and spills. The transport, storage, handling, and use of chemicals would be conducted in accordance with applicable laws, ordinances, regulations, and standards. On-site, dry-type transformers would be used; thus, there would be no oil or hydraulic fluid stored on site related to transformers. The quantities of these materials stored on site would be evaluated to identify the required usage and to maintain sufficient inventories to meet use rates without stockpiling excess chemicals.

In addition to the chemicals listed above, small quantities (less than 55 gallons, 500 pounds or 200 cubic feet) of janitorial supplies, office supplies, laboratory supplies, paint, degreasers, herbicides, pesticides, air conditioning fluids (chlorofluorocarbons [CFC]), gasoline, hydraulic fluid, propane, and welding rods typical of those purchased from retail outlets may also be stored and used at the facility. Flammable materials (e.g., paints, solvents) would be stored in flammable material storage cabinet(s) with built-in containment sumps. Due to the small quantities involved and the controlled environment, a spill could be cleaned up without significant environmental consequences.

Yum Yum 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) and 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 the procedures to be followed in the event of a leak or spill. Adequate supplies of appropriate cleanup materials would be stored on site.

Waste Management

Construction of the Proposed Action is estimated to result in the generation of approximately 36,500 cubic yards of solid waste (912 loads at 40 cubic yards each) consisting of construction debris and general trash, including pallets and flattened cardboard module boxes. Yum Yum Solar estimates that approximately 2,600 flatbed truck loads would be required for hauling equipment and removing waste during construction.

Information on universal wastes anticipated to be generated during Project construction is provided in Table 3-12.

Table 3-12. Summary of construction waste streams and management methods.

Waste stream	Origin and composition	Estimated frequency of generation	On-site treatment	Waste management method/off-site treatment
Construction waste	Empty material containers	Intermittent	None	Return to vendor
Construction waste	Used oil, hydraulic fluid, oily rags	Intermittent	None	Recycle, remove to off-site disposal location
Construction waste	Steel, glass, plastic, wood/pallets, cardboard, paper	Intermittent	None	Recycle wherever possible, otherwise dispose to Class I landfill
Sanitary waste	Human bodily waste	Ongoing during operations	Septic system	Periodically pumped and disposed at sanitary wastewater treatment plant

The anticipated quantities of waste produced during Project operation are summarized in Table 3-13. Universal wastes and unusable materials produced as a result of implementation of the Proposed Action would be handled, stored, and managed in accordance with Tennessee Universal Waste requirements.

Table 3-13. 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– petroleum-related wastes	Tracker drives, hydraulic equipment	1,000 gallons/year	Intermittent	Accumulate for <90 days	Recycle
Oily rags, oil absorbent, and oil filters– petroleum-related wastes	Various	One 55-gallon drum per month	Intermittent	Accumulate for <90 days	Sent off site for recovery or disposed at Class I landfill
Spent batteries	Lead acid/lithium ion	1,000	Every 10 years	Accumulate for <90 days	Recycle

Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects. To the extent permissible, waste will be recycled. Materials that cannot be recycled would be disposed of at an approved facility to be determined by the designated contractor(s). No waste oil shall be disposed of on the Project Site.

If necessary, Yum Yum Solar or its contractor would obtain a hazardous waste generator identification number from the State of Tennessee prior to generating any hazardous waste. Any spills related to the Project would be reported to TDEC. A sampling and cleanup report would be prepared for the solar facility and sent to TDEC to document each spill and clean up. Each spill, regardless of amount, would be cleaned up within 48 hours and a spill report would be completed. Copies of any spill and cleanup reports would be kept on site.

Designated contractor and subcontractor personnel would be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Records of the amounts generated shall be provided to the designated Yum Yum Solar Energy Center environmental specialist.

Wastewater

Permanent toilets would be installed in the operations and management building. These toilets would be connected to a Project septic system adjacent to the building. The septic system and toilets would not be located within 100 feet of any stream or wetland and would be designed based on other local requirements. No adverse effects are anticipated from wastewater treatment and disposal associated with the permanent toilets and associated septic system.

3.11 PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

This section describes an overview of existing public health and safety at the Project Site and the potential impacts to public health and safety associated with the No Action and Proposed Action Alternatives. Analyzed issues include emergency response and preparedness and occupational, or worker, safety in compliance with the OSHA standards.

3.11.1 Affected Environment

The Project Site is currently private property, and agricultural, rural-residential, and undeveloped land uses dominate. Public emergency services in the area include urgent care clinics, hospitals, law enforcement services, and fire protection services. The Fast Pace Urgent Care Clinic, located on US 64, approximately 12 miles (15 minutes) southwest of the Project Site, is the closest urgent care center to the Project Site. The Saint Francis Hospital – Bartlett is the closest hospital, located approximately 23 miles (25 minutes) southwest of the Project Site. Law enforcement services in the Town of Somerville are provided by the Somerville Police Department. Fayette County law enforcement services are provided by the Fayette County Sheriff's Department in the Town of Somerville, approximately nine miles (15 minutes) from the Project Site. The Somerville Police Department is located in Somerville, approximately seven miles (nine minutes) from the Project Site. Fire protection services are provided by the Somerville Town Fire Department and the Fayette County Fire Department (District 15, Station 2), located approximately seven miles (nine

minutes) and 7.2 miles (ten minutes), respectively, from the Project Site. The Tennessee Emergency Management Agency has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials.

3.11.2 Environmental Consequences

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

3.11.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility 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 agricultural, rural-residential, and forested land, and existing public health and safety issues would be expected to remain as they are at present.

3.11.2.2 Proposed Action Alternative

During construction, workers on the Project Site would have an increased safety risk. However, because construction work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. Health and safety plans emphasize BMPs for site safety management to minimize potential risks to workers. Examples of BMPs include employee safety orientations; establishment of work procedures and programs for site activities; use of equipment guards, emergency shutdown procedures, lockout procedures, site housekeeping, and 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 increased traffic on roadways due to construction of the Project. Residential and other human use areas along roadways used by construction traffic to access the Project Site would experience increased commercial and industrial traffic. Awareness of these residences and establishment of traffic procedures to minimize potential safety concerns would be addressed in the health and safety plans followed by construction contractor(s).

Approximately 2,500 gallons of fuel for vehicles would be kept on site in storage tanks during construction of the proposed solar facility. An SPCC plan would be implemented to minimize the potential of a spill and to instruct on-site workers on how to contain and clean up any potential spills. The perimeter of each grouping of Project elements would be securely fenced during construction and for the duration of operation, 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. Emergency response for the Project Site would be provided by the local, regional, and state law enforcement, fire, and emergency responders, as described in the prior section.

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

3.12 TRANSPORTATION

This section describes an overview of existing transportation resources at and near the Project Site, and the potential impacts on transportation resources that would be associated with the No Action and Proposed Action Alternatives. Components of transportation resources that are analyzed include roads, traffic, railroads, and airports.

3.12.1 Affected Environment

3.12.1.1 Roads

The Project Area considered for transportation is located near the Town of Somerville, in the northern portion of Fayette County. The southeast terminus of the Project Site is just over 1.3 miles from the intersection of SR 59 and SR 222 (Stanton Road). Stanton Road is a two-lane, paved public road that extends north-south and bisects the central portion of the Project Site, intersecting with I-40 approximately 3.9 miles north of the Project Site (Figure 2-3). SR 59 is an east-west oriented, paved state highway traversing through Tipton and Fayette counties. SR 59 stretches between the Arkansas state line near Randolph, Tennessee, and SR 76, located just north of Somerville, and abuts the southwestern portion of the Project Site. Yum Yum Road is a two-lane, paved public road that extends north-south and is adjacent to the eastern portion of the Project Site. Yum Yum Road intersects SR 59 approximately 1.8 miles southeast of the Project Site.

Several local roads extend through and, thus, provide access to the Project Site. Fowler Drive and Wilson Road are small local roads that traverse the central portion of the Project Site and intersect each other north of SR 59. Old 59 Drive extends northwest-southeast in the central portion of the Project Site and connects with north-south oriented SR 222. Winfrey Road and Glade Springs Drive extend through the Project Site, intersecting with SR 222 in the southeastern portion. There are also several unnamed, gravel local roads that extend through the Project Site.

3.12.1.2 Road Traffic

Existing traffic volumes on roads in the Project Area were determined using Average Annual Daily Traffic (AADT) counts measured at existing TDOT stations (TDOT 2018). The 2018 AADT count for Station 19, located on SR 59 approximately one mile southeast of the Project Site, consisted of 1,790 vehicles. The 2018 AADT count for Station 110, on SR 59 approximately 2.7 miles west of the Project Site, consisted of 2,503 vehicles. The 2018 AADT count for Station 18, located along SR 222 (Stanton Road) approximately 0.75 mile from the Project Site, consisted of 670 vehicles. At Station 17, located on Yum Yum Road approximately 1.5 miles southeast of the Project Site, there were 485 daily vehicles in 2018. Station 77, near the intersection of Hall Drive and Yum Yum Road, approximately 0.5 mile north of the Project Site, experienced 69 vehicles daily in 2018.

3.12.1.3 Rail and Air Traffic

The closest rail line is operated by CSX Transportation and is located approximately 6.4 miles northwest of the Project Site. The closest general aviation airport is the Fayette County Airport in

Somerville, located approximately seven miles south of the Project Area. The airport consists of one runway 5,000 feet long. The closest regional airport is the Millington-Memphis Airport, formerly known as Millington Regional Jetport in Millington, Tennessee, located approximately 24 miles west of the Project Area. The airport consists of one runway 8,000 feet long. The closest major airport is the Memphis International Airport in Memphis, Tennessee, approximately 34 miles southwest of the Project Area. The airport has four runways, all with lengths of nearly 9,000 feet or more.

3.12.2 Environmental Consequences

This section describes the potential impacts to transportation resources 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 would not be constructed. Therefore, no Project related impacts on transportation resources would result. Existing land use would be expected to remain a mix of agricultural, rural-residential, and undeveloped, forested land, and the existing transportation network and traffic conditions would be expected to remain as they are at present.

3.12.2.2 Proposed Action Alternative

The construction and operation of the Project would have no effect on operation of the airports in the region. The operation of the Project would not affect commercial air passenger traffic or freight traffic in the region and would not adversely affect any aerial crop dusters operating in the vicinity of the Project Site.

During construction of the proposed solar facility, a crew of approximately 150 to 500 people would be present at the Project Site between sunrise and sunset, seven days a week. A majority of these workers would likely come from the local area or region. Other workers would come from outside the region, and many would likely stay in local hotels in the vicinity. It is anticipated that workers would drive personal vehicles to the Project Site. Some of the individual workers and work teams would likely visit local restaurants and other businesses during the construction phase of the Project. Additional traffic due to deliveries and waste removal would consist of approximately five vehicles per day during construction, as discussed in more detail below.

Traffic flow around the Project Site would be heaviest at the beginning of the work day, at lunch, and at the end of the work day. Deliveries and most workers would likely access the Project Site from the west on SR 59. The Fayette County Industrial Park is located at the intersection of SR 59 and Yum Yum Road, and a limited number of residences are present alongside SR 59 in the vicinity of the Project Site. Some traffic to Fayette Ware High School and Jefferson Elementary School on SR 59 and East Junior High School on Leach Drive would likely travel north and south on SR 59, southeast of the Project Site. Should substantial traffic congestion occur, Yum Yum Solar would implement staggered work shifts to assist traffic flow near Project Site access points and would also post a flag person during the heavy commute periods to manage traffic flow and

to prioritize access for local residents. Implementation of such mitigation measures would minimize potential adverse impacts to traffic and transportation to negligible levels.

Construction equipment and material delivery and waste removal would require approximately 20 flatbed semi-trailer trucks or other large vehicles visiting the Project Site each day during the 20-month construction period. The Project Site can be accessed via routes that do not have load restrictions. These vehicles should be easily accommodated by existing roadways; therefore, only minor impacts to transportation resources in the Project Area would be anticipated as a result of construction vehicle activity.

Several on-site access roads would be maintained on the Project Site. Following construction, the compacted gravel roads would be maintained to allow access for inspection and maintenance activities. However, these roads would be closed to the public. Permanent access to the Yum Yum 161-kV Switching Station would be off of Fowler Road.

Due to the proximity of the Project Site to the Town of Somerville, possible minor traffic impacts along I-40, SR 59, and Stanton Road could occur, as workers could potentially commute to the Project Site from northeast Memphis. However, the proposed workforce would consist of a maximum of 500 employees for only part of the construction period; therefore, the addition of these vehicles to the existing traffic on I-40, SR 59, and Stanton Road would be considered moderate temporary impacts. However, use of mitigation measures, such as posting a flag person as discussed above, would minimize potential adverse impacts to traffic and transportation to minor or negligible levels.

The Yum Yum Solar Energy Center would be staffed by up to six full-time workers who would live in the area. The addition of vehicles for full-time staff on local roadways would be accommodated by existing infrastructure; therefore, the operation of the Project would not have a noticeable impact on the local roadways.

Overall, direct impacts to transportation resources associated with implementation of the Proposed Action would be anticipated to be minor to moderate and minimized or mitigated. The Proposed Action would not result in any indirect impacts to transportation.

3.13 SOCIOECONOMICS

This section describes an overview of existing socioeconomic conditions in the Project Area, and the potential impacts to socioeconomic conditions that would be associated with the No Action and Proposed Action Alternatives. Components of socioeconomic resources that are presented include population, employment, and income.

3.13.1 Affected Environment

The Project Site is located in an unincorporated portion of northern Fayette County, Tennessee, approximately five miles north-northwest of the Town of Somerville. The Project Site overlaps U.S. Census Bureau (USCB) 2010 Census Tract (CT) 603 and CT 608 (Figure 3-13). To accurately represent socioeconomic conditions on the Project Site, the USCB data assigned to these CTs are presented in proportion to the area their geographic extent overlaps the Project

Site or as a combined average. Generally, CT 603 encompasses the northwestern corner of Fayette County and includes portions of the I-40 corridor and the cities of Braden and Gallaway. CT 608 comprises the remainder of northern Fayette County, which is primarily rural and does not include any densely populated areas. The portion of CT 603 that overlaps the Project Site is approximately 262 acres, or 0.5 percent of the entire area of CT 603, and the portion of CT 608 that overlaps the Project Site is approximately 2,615 acres, or 3.2 percent of the CT 608's total area.

3.13.1.1 Population and Demographics

The population of Fayette County, as reported in the 2010 USCB decennial census (2010 Census), was 38,413 (USCB 2019). The 2017 population of the Project Site is approximated at 88 people, according to the associated CT data reported in the 2013 to 2017 American Community Survey 5-Year Estimates (2017 ACS). This estimate represents an approximate 15 percent decrease from 2010. The Tennessee State Data Center (2019) projects that the population of Fayette County will increase by approximately 21 percent by 2040. However, based on current trends, population increases would likely concentrate in portions of the county outside the Project Area. Population trends for the Project Site and the entirety of each associated CT, as compared with Fayette County and the state, are presented in Table 3-14.

Table 3-14. Population trends in the Project Area.

Geography	2010 Census	2017 ACS	Percent Change 2010-2017	Projection 2040	Percent Change 2017-2040
Project Site (based on proportion of CT data)	101	88	-15.4	--	--
CT 603	2,951	3,177	7.1	--	--
CT 608	2,717	2,252	-20.6	--	--
Fayette County	38,413	39,336	2.4	49,875	21.1
Tennessee	6,346,105	6,597,381	3.8	7,853,224	16.0

Sources: Tennessee State Data Center 2019; USCB 2019

The population of Fayette County and that of the CTs associated with the Project Site had higher median ages than the state as a whole, according to the 2017 ACS (USCB 2019). As estimated using associated CT data, the Project Site had a lower percentage of people who were at least high school graduates (83 percent) than across the county or state (87 percent and 86.5 percent, respectively). Higher percentages of people in the Project Area (an average of 94 percent) maintained the same residence from one year prior to the 2017 ACS than in the county (92 percent) or Tennessee as a whole (85.2 percent).

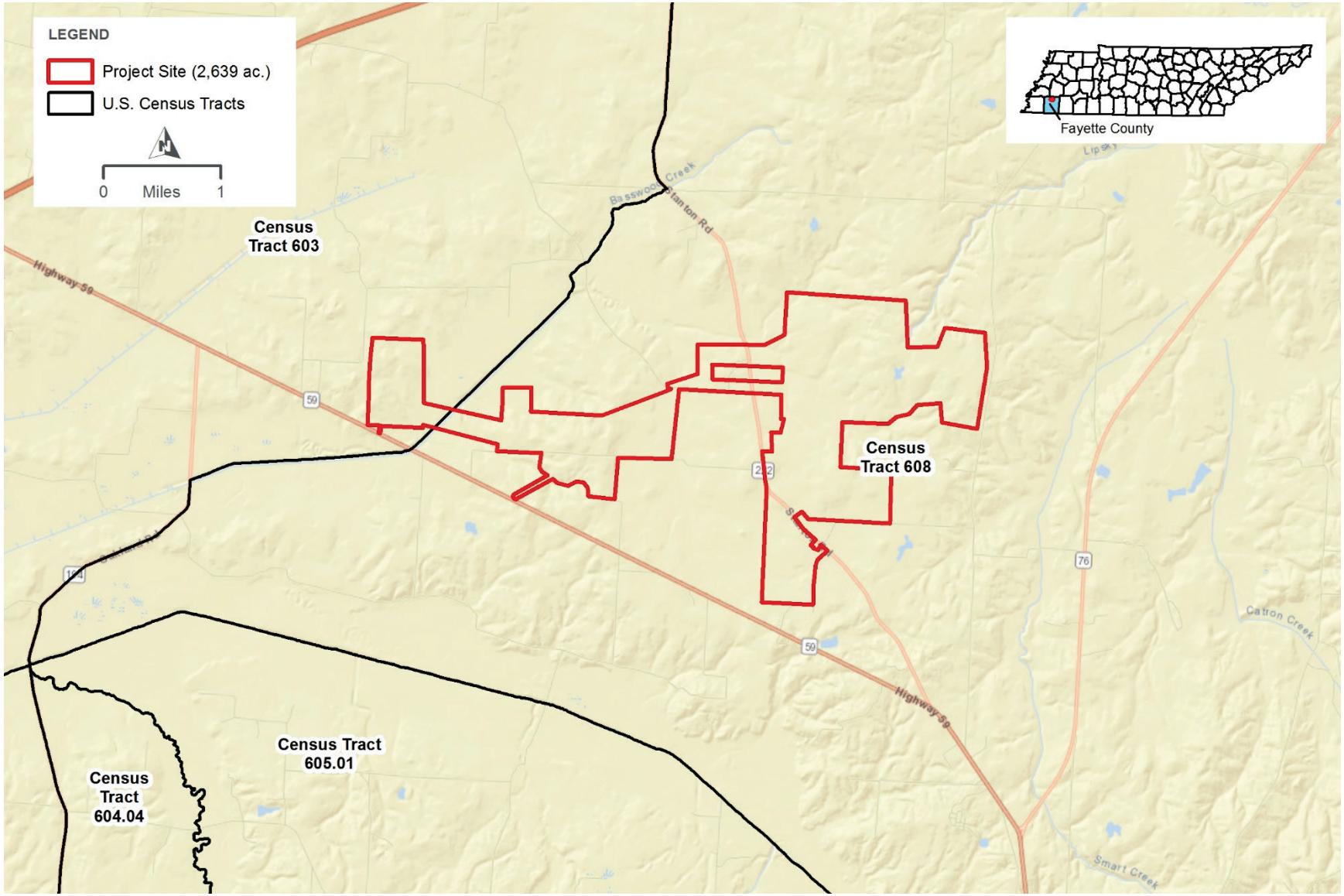

Figure 3-13. 2010 U.S. Census Bureau census tracts in the Project Area.

3.13.1.2 Employment and Income

According to the Tennessee Department of Labor and Workforce Development (TDLWD), manufacturing, government, and retail trade have the highest employment numbers among the top industries in Fayette County (TDLWD 2019). In 2018, Fayette County had a total employment of approximately 18,138 jobs (Table 3-15). The 2018 unemployment rate for Fayette County was 3.8 percent, representing a 2.4 point decrease since 2015. This rate is slightly higher than the 2018 state unemployment rate of 3.5 percent. According to the 2017 ACS, the median household income for Fayette County was $57,919, which was greater than the state and the nation as a whole ($48,708 and $57,652, respectively). On the Project Site, the median household income was estimated as $47,315, lower than the county and state.

Table 3-15. Employment and income in the Project Area.

Geography	2018 Employment	2018 Unemployment Rate	Median Household Income, 2017 ACS
Project Site (based on average of CT data)	--	--	$47,315
CT 603	--	--	$43,244
CT 608	--	--	$51,385
Fayette County	18,138	3.8	$57,919
Tennessee	3,129,078	3.5	$48,708

Source: TDLWD 2019; USCB 2019.

3.13.2 Environmental Consequences

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 in expenditures for goods and services and short- and long-term effects on employment and income.

3.13.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no socioeconomic effects from the Project would occur. Existing land use would be expected to remain a mix of agricultural, rural-residential, and undeveloped, forested land, and existing socioeconomic conditions would be expected to remain as they are at present.

3.13.2.2 Proposed Action Alternative

Under the Proposed Action, a new solar facility would be built in the Project Area. Construction activities at the Project Site would take approximately 20 months to complete with a crew of approximately 150 to 500 workers at the site, depending on construction activities. Workers would include general laborers and electrical technicians. Work would generally occur seven days a week during daylight hours. Short-term beneficial economic impacts would result from construction activities associated with the Project, including 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 Fayette County and/or in adjacent counties. Most of the other components of the solar and transmission facilities would be acquired from outside the local area. Also, most of the construction workforce would be sought locally or within the region, while a small portion of the construction workforce might come from out of the region. The direct impact to the economy associated with construction of the Project would be short-term and beneficial.

The majority of the indirect employment and income impacts would be 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. Construction of the Project could have minor beneficial indirect impacts to population and short-term employment and income levels in Fayette County.

During operation of the solar facility, a full-time workforce of up to six people would be on site five days a week from 7 A.M. to 5 P.M. This workforce would manage and maintain the Yum Yum Solar Energy Center and conduct regular inspections. Grounds maintenance and some other operation and maintenance activities may be conducted by local contractors. Therefore, operation of the solar facility would have a small positive impact on employment and population in Fayette County.

Overall, socioeconomic impacts for the operation of the proposed solar facility would be positive and long-term, but 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 Fayette County and the vicinity. Additionally, the local governments would not have to provide any of the traditional government services typically associated with a large capital investment, such as water, sewer, or schools.

3.14 ENVIRONMENTAL JUSTICE

This section describes an overview of environmental justice considerations within the Project Area and the potential impacts to environmental justice populations that would be associated with the No Action and Proposed Action Alternatives. Components of environmental justice that are presented include the proportions of the local population that are minority and low-income and the potential for effects to these populations.

3.14.1 Affected Environment

Environmental justice-related impacts are analyzed in accordance with E.O. 12898 to identify and address as appropriate disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority and low-income populations. While not subject to this E.O., TVA routinely considers environmental justice in its NEPA review processes.

Council of Environmental Quality (CEQ) guidance directs identification of minority populations when either the minority population of the affected area exceeds 50 percent or the minority population percentage of the study area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

CEQ defines minority populations as people who identify themselves as Asian or Pacific Islander, American Indian or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Due to including one of these minorities, those indicating two or more races are also considered minorities. Minority populations were defined as those exceeding 50 percent.

CEQ guidance specifies that low-income populations are to be identified using the annual statistical poverty threshold from the USCB Current Population Reports Series P-60 on Income and Poverty. The USCB-provided 2017 poverty threshold for individuals under age 65 was $12,752, and the official poverty rate for the United States (U.S.) as a whole in 2017 was 12.3 percent (USCB 2018). Due to availability, low-income populations were defined as those with poverty rates estimated for all people that are above the U.S. poverty rate of 12.3 percent.

Based on CEQ guidance, USCB data reported in the 2017 ACS were used to identify minority and low-income populations in the Project Area. As discussed in more detail in Section 3.14.1.1, the Project Site overlaps approximately 0.5 percent of the total area of USCB 2010 CT 603 and approximately 3.2 percent of the total area of CT 608 (Figure 3-13). The Project Site lies more specifically within approximately 1.1 percent of Block Group (BG) 1, CT 603 and approximately 9.3 percent of BG 2, CT 608. To accurately represent environmental justice conditions on the Project Site and depending on availability, the USCB data assigned to these BGs or the entire CTs are presented in proportion to the area their geographic extent overlaps the Project Site or as a combined average.

3.14.1.1 Minority Population

As of the 2017 ACS, minorities constituted approximately 30 percent of the total population in Fayette County (Table 3-16). This percentage is higher than the state minority percentage of 22.2. In the Project Area, BG 1, CT 603 had a minority population of 87.7 percent, and BG 2, CT 608 had a minority population of 43.5 percent. The Project Site had an estimated minority population of 51.7 percent, higher than the county, state, and nation. According to the USEPA EJSCREEN, an environmental justice screening and mapping tool, on the Project Site and within a 1-mile radius of the Project Site, the minority population is estimated to be 64 percent (USEPA 2019d). While the USCB and USEPA findings differ, both indicate a minority population in the Project Area exceeding the 50 percent threshold noted in CEQ guidance. The prominent minority race or ethnicity in the Project Area was Black or African American. Within BG 2, CT 608, an Asian population (designated as Other Asian) ranked second most numerous, accounting for approximately 9 percent of the population. A Hispanic or Latino population ranked second most numerous within BG 1, CT 603, composing approximately one percent of the population.

Table 3-16. Minority population in the Project Area.

Geography	Minority Population	% Minority Population
Project Site (based on proportion/average of BG data)	37	51.7
Block Group 1, CT 603	983	87.7
Block Group 2, CT 608	278	43.5
Fayette County	11,782	30.0
Tennessee	1,465,595	22.2

Source: USCB 2019

3.14.1.2 Poverty

Based on the 2017 ACS, the poverty rate for all people in Fayette County was 14.4 percent (Table 3-17). Based on the CT average, the Project Site had an estimated poverty rate of 18.8 percent. This poverty rate is higher than the rates of the county, state, and nation. According to the USEPA EJSCREEN, on the Project Site and within a 1-mile radius of the Project Site, the low-income population is estimated at 40 percent, and the per capita income is approximately $26,430 (USEPA 2019d).[1] On the Project Site, the estimated poverty rate for all people was higher than the county, the state, and the official U.S. poverty rate (12.3 percent).

Table 3-17. Poverty in the Project Area.

Geography	Per Capita Income, People in Families	Poverty Rate, People in Families	Poverty Rate, All People
Project Site (based on average of CT data)	$23,807	14.2	18.8
CT 603	$21,399	23.8	26.3
CT 608	$26,214	4.5	11.2
Fayette County	$30,471	12.5	14.4
Tennessee	$27,277	14.0	16.7

Source: USCB 2019

3.14.2 Environmental Consequences

This section describes the potential impacts on environmental justice populations should the Proposed Action or No Action Alternatives be implemented. According to 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

[1] EJScreen defines low-income populations as “Percent of individuals whose ratio of household income to poverty level in the past 12 months was less than 2 (as a fraction of individuals for whom ratio was determined).” The source of the minority data in EJScreen is USCB 2012 to 2016 ACS 5-Year Estimates.

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).

3.14.2.1 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.

3.14.2.2 Proposed Action Alternative

Based on the analyses presented in Section 3.14.1, including the results of the USEPA EJSCREEN analyses, minority and low-income populations are present in the Project Area at higher rates than the county and state. In regards to low-income status, the Project Site has an estimated poverty rate that is higher than the official U.S. poverty rate of 12.3 percent.

The overall impacts of the proposed Yum Yum Solar Energy Center, as described in other sections in this chapter, most of which would occur during the 20-month construction period, would be minor, and off-site impacts would be negligible. As such, no disproportionately high or adverse direct or indirect impacts on minority or low-income populations due to human health or environmental effects are expected to result from the Proposed Action.

CHAPTER 4

4 ANTICIPATED ENVIRONMENTAL IMPACTS AND CUMULATIVE IMPACTS

This chapter summarizes the anticipated adverse environmental impacts of the Project and considers the relationship between short-term uses and long-term productivity and whether the Project makes irreversible and irretrievable commitments of resources. This chapter also considers the cumulative impacts in relation to other ongoing or reasonably foreseeable proposed activities within the Project Area.

4.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The Proposed Action could cause some unavoidable adverse environmental effects (see Table 2-1). Specifically, construction activities would temporarily increase noise, traffic, and health and safety risks and temporarily affect air quality, GHG emissions, and visual aesthetics of the Project Site vicinity. Construction activities would primarily be limited to daytime hours, which would minimize noise impacts. Temporary increases in traffic would be minimized or mitigated by instituting staggered work shifts during daylight hours and/or posting a flag person during the heavy commute periods. Temporary increases in health and safety risks would be minimized by implementation of the Project health and safety plan. Construction and operations would have minor, localized effects on soil erosion and sedimentation that would be minimized by soil stabilization and vegetation management measures. Selective maintenance of tree buffers and/or fence screening along the perimeter of the Project Site would minimize effects to visual resources, during both construction and operation. The Project would change land uses on the Project Site from primarily agricultural to solar uses, where these practices are not presently occurring; however, solar power as a land use type is considered a special exception in this portion of Fayette County.

With the application of appropriate BMPs, no unavoidable adverse effects to groundwater are expected. Minor unavoidable adverse impacts affecting up to six potentially jurisdictional streams (0.42 acre; 96 linear feet) due to road crossings and 63 potentially nonjurisdictional WWCs (34,920 linear feet) due to placement of solar panels are anticipated. Some impacts to potentially nonjurisdictional WWCs could also occur due to road crossings. Long-term habitat loss would also occur due to alteration of land use on 1,624 acres of the Project Site. Revegetation of the Project Site with native and/or noninvasive grasses and herbaceous vegetation would help minimize effects to open, grassy habitats. The Project is not expected to adversely affect any federally or state-listed species due to potential summer roosting habitat being removed between October 15 and March 31, when NLEBs would be roosting outside of the Project Area in caves. Consultation under Section 7 of the ESA was performed with the USFWS on June 11, 2019; concurrence was received from the USFWS on June 21, 2019 (Appendix F).

4.2 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Short-term uses are those that generally occur on a year-to-year basis. Examples are wildlife use of forage, timber management, recreation, and uses of water resources. Long-term productivity is the capability of the land to provide resources, both market and nonmarket, for future

generations. In this context, long-term impacts to site productivity would be those that last beyond the life of the Project. The Proposed Action would affect short-term uses of the Project Site by converting it from agricultural and undeveloped land to solar power generation. The effects on long-term productivity would be minimal as existing land uses could be readily restored on the Project Site following the decommissioning and removal of the solar facility.

4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible or irretrievable commitment of resources would occur when resources would be consumed, committed, or lost because of the Project. The commitment of a resource would be considered irretrievable when the Project would directly eliminate the resource, its productivity, or its utility for the life of the Project and possibly beyond. Construction and operation activities would result in an irretrievable and irreversible commitment of natural and physical resources. The implementation of the Proposed Action Alternative would involve irreversible commitment of fuel and resource labor required for the construction, maintenance, and operation of the solar energy system. Because removal of the solar arrays and associated on-site infrastructure could be accomplished rather easily, and the facility would not irreversibly alter the site, the Project Site could be returned to its original condition or used for other productive purposes once it is decommissioned. Most of the solar facility components could also be recycled after the facility is decommissioned.

4.4 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 action in the vicinity.

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

- Local and regional news sources;
- Town of Somerville government website records, including planning commission meetings, city meeting minutes, and public notices;
- Chamber of Commerce websites and meeting minutes; and
- TDOT website.

The proposed Project would result in minor direct impacts to land use, geological resources and farmlands, water resources, biological resources, visual resources, noise, air quality, public health and safety, and transportation.

4.4.1 Federal Projects

This section addresses other projects with possible effects on land use, geological resources and farmlands, water resources, biological resources, visual resources, noise, air quality, public health and safety, and transportation.

Two federal projects were identified in the vicinity of the Project Site. TDOT lists two related transportation projects nearby in the Town of Somerville that are being funded by the IMPROVE Act. The act is providing funding for 962 road and bridge projects across the state (State of Tennessee 2019b). Both projects in the Town of Somerville are listed as Rural Access projects, which ensure adequate and efficient transportation for the state's agricultural industry and other small town businesses. Both projects are segments of the Somerville Beltway (SR 460). The purpose of the Somerville Beltway is to provide a facility that meets present and future traffic demands and provides motorists with improved connections to other major highways, such as SR 15 (US 64) and SR 76. One 2.8-mile long project is from near SR 15 (US 64) west of Somerville to near SR 76 south of Somerville. The other related 2.55 mile-long project is from near SR-76 south of Somerville to near SR 15 east of Somerville. As both projects are intended to improve agricultural-related travel and given the nature of the impacts of the proposed Yum Yum Solar Energy Center, the Proposed Action is unlikely to contribute to cumulative adverse effects to the same resources affected by the IMPROVE Act-funded projects.

4.4.2 State and Local Projects

Fayette County's *City & County Growth Plan* identifies the Somerville Urban Growth Boundary between Somerville and the junction of SR 59 and SR 76 but not extending into the Project Site (Fayette County 2009). Likewise, the plan shows a Planned Growth Area at the intersection of I-40 and SR 59, outside of the Project Site, near the Town of Braden. Both of these growth areas are approximately two miles from the Project Site. The Project Area and, generally, the northern portion of Fayette County, within which the Project Site lies, remains designated as rural, with solar power as a special exception land use type.

There are no known recent or planned state and local projects in the Project Site vicinity.

CHAPTER 5

5 LIST OF PREPARERS

5.1 PROJECT TEAM

Table 5-1 presents the members of the Project team and summarizes the expertise of each member and their contributions to this EA.

Table 5-1. Yum Yum Solar Energy Center Environmental Assessment Project Team

Name/Education	Experience	Project role
TVA		
Adam Datillo M.S. Forestry B.S. Natural Resource Conservation Management	20 years of experience in ecological restoration and plant ecology and 15 years in botany	Vegetation, Threatened and Endangered Species (Plants)
Travis A. Giles M.S. Environmental Science, B.S. Environmental Policy NEPA Specialist	17 years in environmental policy and permitting	NEPA compliance, Document preparation
Elizabeth B. Hamrick M.S., Wildlife; B.S., Biology Zoologist	19 years conducting field biology, 8 years in biological compliance, NEPA compliance, and ESA consultation for T&E terrestrial animals	Terrestrial zoology
Michaelyn Harle Ph.D., Anthropology; M.A. Anthropology; B.A. Anthropology Archaeologist	15 years in cultural resource management	Cultural resources, NHPA Section 106 compliance
Craig Phillips M.S. and B.S. Wildlife and Fisheries Science	10 years sampling and hydrologic determination for streams and wet-weather conveyances; 9 years in environmental reviews.	Aquatic Ecology, Threatened and Endangered Aquatic Species
Kim Pilarski-Hall M.S. and B.S. Geography, Minor in Ecology	21 years of experience in wetlands assessment and delineation	Wetlands and Natural Areas

Name/Education	Experience	Project role
Emily Willard Program Manager, Environmental Permitting & Compliance B.S., Environmental Science	15 years in environmental compliance, preparation of environmental documents	Project coordination, Document preparation and review
A. Chevales Williams B.S. Environmental Engineering	14 years in water quality monitoring and compliance; 13 years in NEPA planning and environmental services	Permits and Compliance – Surface Water and Erosion
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
HDR		
Thomas Blackwell, PWS M.S., Environmental Resource Management; B.A. Natural Science (Geography)	13 years in stream and wetland delineations and restoration design, permitting, NEPA documentation, and project management	Environmental Planner, overall project management, document preparation
Michael S. DeRuyter B.S., Natural Resources and Environmental Studies, Soil Science	25 years in wetland delineations, mitigation design, permitting, and project management	Sr. Environmental Planner, document preparation and QA/QC
Mark P. Filardi, P.G. M.S. and B.S., Geology	19 years in hydrogeology and contaminated site assessment and remediation	Document preparation
Josh Fletcher, RPA M.A., Anthropology (Archaeology); B.S., Architectural Design	22 years in cultural resources management, regulatory compliance, NEPA documentation, and project management	Environmental Planner, document preparation

Name/Education	Experience	Project role
J. Wayne Hall *B.S. Marine Science*	25 years in combined regulatory compliance, preparation of environmental review documents, and project management	Sr. Environmental Scientist, document preparation
Edward Liebsch M.S., Meteorology; B.A., Earth Science (Chemistry minor)	38 years in air dispersion analysis, air quality permitting, NEPA air quality analysis and climate assessments	Document preparation
Katie Lueth *B.S Ecology and Environmental Science, Geospatial Information Systems Certification*	5 years in environmental sciences and wetland delineation	GIS mapping, document preparation
Jason McMaster, PWS M.S., Environmental Science; M.A., Biology; B.S., Business Administration	11 years in combined regulatory compliance, preparation of environmental review documents, and project management	Environmental Scientist, document preparation
Charles Nicholson B.S., Wildlife and Fisheries Science M.S., Wildlife Management PhD, Ecology and Evolutionary Biology	17 years in wildlife and endangered species research and management, 24 years in NEPA compliance	Document QA/QC
Harriet L. Richardson Seacat M.A., Anthropology (Cultural); B.A., Anthropology (Native American Studies minor)	18 years in anthropology, archaeology, history, NHPA and NEPA documentation, and project management	Project NEPA Lead, Environmental Planner, document preparation and coordination lead, GIS mapping
Miles Spenrath B.S., Environment and Natural Resources	7 years in NEPA compliance	GIS mapping, document preparation
Michael Swenson *B.S. Biology*	12 years in environmental sciences, wetland delineation and permitting, NEPA compliance	Environmental Scientist, document preparation

Name/Education	Experience	Project role
Kelly Thames. PWS B.A., Environmental Science M.S., Plant Biology	7 years in ecology, biology, stream and wetland delineations, permitting, habitat evaluation and restoration, and GIS mapping	Environmental Scientist, biological and water resource studies QA/QC, document preparation
Blair Goodman Wade, ENV SP M.E.M., Environmental Management; B.S., Integrated Sciences and Technology (Environmental Science and GIS)	14 years in regulatory compliance, NEPA documentation, and mitigation planning	Sr. Environmental Planner, document QA/QC

CHAPTER 6

6 REFERENCES

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