Document Type: EA-Administrative Record
Index Field: Final EA
Project Name: SR Innovation
Project Number: **2018-29**

SR Innovation Solar Photovoltaic Facility

Shelby County, Tennessee

FINAL ENVIRONMENTAL ASSESSMENT

Prepared for:
Tennessee Valley Authority
Knoxville, Tennessee

Submitted By:
Silicon Ranch Corporation

Prepared By:
HDR, Inc.

December 2018

FINAL

For Information, contact:
W. Douglas White
NEPA Compliance
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, Tennessee 37902-1499
Phone: 865-632-2251
Email: wdwhite0@tva.gov

Table of Contents

List of Tables

List of Photos

List of Figures

Appendix

CHAPTER 1

1.0 INTRODUCTION

The Tennessee Valley Authority (TVA) proposes to enter into a power purchase agreement (PPA) with SR Innovation, LLC (SR Innovation), the facility-specific entity affiliated with Silicon Ranch Corporation (SRC), to purchase the electric power generated by a proposed solar photovoltaic (PV) facility in Memphis, Shelby County, Tennessee. The proposed SR Innovation solar facility, known herein as the "Project," would be constructed and operated by SR Innovation and would have direct current (DC) generating capacity of 2 megawatts (MW). The PPA would be executed through TVA's Distributed Solar Solutions (DSS) program, under which TVA agrees to purchase qualifying renewable energy at set prices for a 20-year period. TVA's action is herein referred to as the "Proposed Action."

The proposed SR Innovation solar facility would occupy approximately 45 acres located approximately 10 miles northeast of downtown Memphis (Figure 1-1, Figure 2-1, and Figure 2-2). The 45-acre tract is composed of 31 acres that would be owned by SRC and leased to SR Innovation, LLC, and one partial parcel totaling 14 acres that would remain owned by Belz Enterprises. The Project would consist of multiple parallel rows of PV panels on single-axis tracking structures, DC to alternating current (AC) inverters, and one transformer. It would connect to the existing Memphis Light Gas and Water (MLGW)-owned overhead 12.47-kilovolt (kV) powerline along the southern boundary of the project site. SR Innovation is developing the Project in partnership with Nike, Inc. (Nike), MLGW, and TVA to support Nike's mission to source 100 percent renewable energy by 2025.

1.1 PURPOSE AND NEED FOR ACTION

In its 2011 Integrated Resource Plan (IRP; TVA 2011) TVA established the goal of increasing its renewable energy generating capacity by 1,500 to 2,500 MW by 2020. TVA established the Renewable Standard Offer program and the Solar Solutions Initiatives (SSI) pilot as two means of meeting this goal. 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. The SSI pilot was redesigned to allow for greater Local Power Company (LPC) involvement and more LPC-directed projects. The resulting pilot was named DSS. Under the DSS pilot, TVA purchases energy at established terms and conditions (the "standard offer") from operators of qualifying renewable energy-generating facilities. Qualifying facilities must be new, located within the TVA service area, and must generate electricity from specific technologies or fuels. Solar PV generation is one of the qualifying technologies. The proposed PPA for the SR Innovation solar facility would be executed through the DSS program and help TVA meet its need and goal for additional renewable generating capacity.

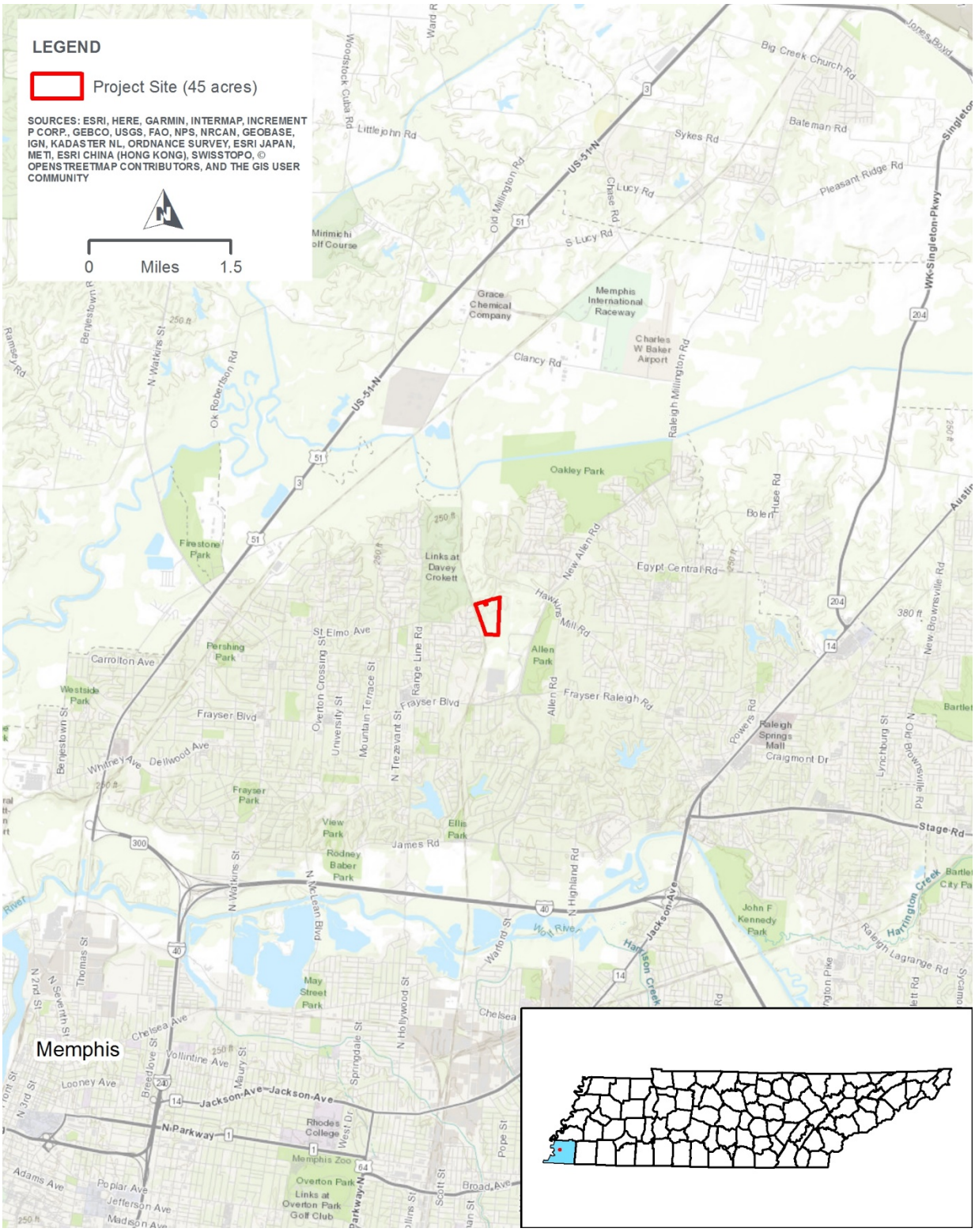


Figure 1-1. SR Innovation project site in Shelby County, Tennessee.

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 TVA's Proposed Action (the purchase of power under the PPA) and the associated impacts of the construction and operation of the proposed solar facility.

TVA's Proposed Action would result in the construction and operation of the proposed solar facility by SR Innovation, LLC, as well as the construction and operation of the electrical interconnection by TVA. The scope of this EA therefore focuses on impacts related to the construction and operation of the proposed solar facility and associated electrical interconnection.

This EA (1) describes the existing environment in the project area, the potentially affected areas within and surrounding the project site, (2) analyzes potential environmental impacts associated with the Proposed Action and the No Action Alternative, and (3) identifies and characterizes 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 varies by each resource, as defined in Chapter 3.

Under the PPA, TVA's obligation to purchase renewable power would be contingent upon the satisfactory conclusion of the environmental review and TVA's determination that the Proposed Action would be "environmentally acceptable." To determine acceptability, TVA must conclude that no significant impacts to the human environment would result from the location, operation, and/or maintenance of the proposed solar facility and that all project activities would be consistent with applicable federal, state, and local environmental laws and regulations.

Based on internal scoping, identification of applicable laws, regulations, executive orders, and policies, TVA identified the following resources as requiring analysis within this EA: Land Use; Geology and Soils; Water Resources; Biological Resources; Visual Resources; Noise; Air Quality and Greenhouse Gases; Cultural Resources; Solid and Hazardous Waste; Transportation; and Socioeconomics and Environmental Justice.

TVA also considered potential effects related to utilities, public and occupational health and safety, recreation, and parks and natural areas. However, TVA found potential effects to these resources to be absent or minor and to not require further evaluation.

This EA consists of six chapters discussing the Alternatives, resources potentially affected, and analyses of impacts. This document includes appendices with supporting information. In its final form, this document will include additional appendices that contain correspondence and other supporting information. The structure of the EA is outlined below:

- **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 Proposed Action and No Action Alternative, provides a comparison of the Alternatives, and discusses the Preferred Alternative.
- **Chapter 3:** Discusses the affected environment and the potential direct and indirect impacts on these resources. 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.
- **Chapter 5:** Discusses the cumulative impacts in relation to other ongoing or reasonably foreseeable proposed activities within the area surrounding the project site.
- **Chapters 6 and 7:** Contain the List of Preparers of this EA, and the References cited in preparation of this EA, respectively.
- **Appendices:** Supporting information.

1.3 PUBLIC AND AGENCY INVOLVEMENT

SR Innovation developed the Project in partnership with Nike, MLGW, and TVA to support Nike's renewable energy goals. Public announcements on websites and local news sources were made by MLGW, Nike, and SR Innovation beginning in May 2017 (Bebon 2017; MLGW 2017; Smith 2017; SRC 2017). Throughout the planning process, SR Innovation has closely coordinated with Nike, as a partner in the Project and owner of property in the vicinity of the Project, and Belz Enterprises, as the current owner of the project site and surrounding land. Similar to the other public announcements, a press release by MLGW in May 2017 informed the public that MLGW had been awarded a solar generation project through TVA's DSS pilot program (MLGW 2017). The announcement also indicated that SR Innovation would fund, build, own, and operate the planned 2-MW solar facility to be built at Nike's North America Logistics Campus – Memphis (NALC-Memphis). In the project development process, SR Innovation also consulted with the City of Memphis regarding any zoning limitations and determined that the property is currently zoned for solar development and no special use permit is required.

Public and agency involvement also included publication of the draft EA for a 14-day public and agency review and comment period. The public comment period was facilitated by a website with information about the Project (TVA 2018a). TVA notified appropriate local, state, and federal agencies and federally recognized tribes of the draft EA's availability and entered into consultations with those agencies and tribes to assess particular impacts. Consultations occurred with the United States Fish and Wildlife Service (USFWS) regarding protected species and Tennessee State Historical Preservation Officer (SHPO) and federally recognized tribes in relation to historic properties and other cultural resources. The agencies and tribes concurred with findings or had no comment, as reported in relevant subsections of Section 3.0 and as shown in the appendices. TVA received no comments from the public on the draft EA.

1.4 PERMITS AND APPROVALS

SR Innovation's selected construction contractor would be required to submit a Tennessee Construction General Permit (CGP) Notice of Intent (NOI) to the Tennessee Department of Environment and Conservation (TDEC) to obtain coverage under the General Construction Stormwater National Pollutant Discharge Elimination System (NPDES) permit. If granted, a Notice of Coverage under the NPDES permit would authorize discharges associated with construction activities that result in a total land disturbance of 1 acre or greater and sites less than 1 acre but part of a larger common plan of development or sale, as governed by Section 402 of the Clean Water Act (CWA) (see Section 2.2.2). In accordance with CGP requirements, SR Innovation and the construction contractor would develop a site-specific Storm Water 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 design, inspection, and maintenance of Best Management Practices (BMPs) must be prepared in accordance with good engineering practices and shall be consistent with the requirements and recommendations contained in the Tennessee Erosion and Sediment Control Handbook.

Vegetative waste from clearing activities would be burned or chipped and grinded. If any open burning of minimal debris from tree clearing on the site will occur, the appropriate open burning permits would be obtained from the Memphis Fire Department and the City of Memphis. Information on open or surface burning issued by the Shelby County Fire Department 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.

The installation of one pipe culvert in a wetland for an access road would meet the terms and conditions of the CWA Section 404 Nationwide Permit (NWP) Number 51 (Land-Based Renewable Energy Generation Facilities). NWP 51 is a general permit issued by the United States Army Corps of Engineers (USACE) that authorizes discharges of dredged or fill material into Waters of the United States (U.S.), including streams and wetlands, provided the activity meets specific criteria for the construction, expansion, or modification of land-based renewable energy production facilities, including attendant features. Given that the area of the wetland to be affected would be less than 0.1 acre, the Project would occur under NWP 51 and not require pre-construction notification to the USACE Memphis District.

Certification from Tennessee would be sought to verify that the permitted discharges comply with the state's applicable effluent limitations and water quality standards. If approved, the TDEC Division of Water Resources will issue this Section 401 water quality certification in the form of an Aquatic Resource Alteration Permit (ARAP). The proposed project impacts meet the general and special conditions of the TDEC ARAP (NR1705.016) for Minor Alterations to Wetlands. However, written authorization is required from TDEC.

This page intentionally left blank.

CHAPTER 2

2.0 DESCRIPTION OF THE PROPOSED SOLAR PROJECT AND ALTERNATIVES

This chapter describes the Project, 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. For alternatives eliminated from further consideration, see Appendix A.

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 can be measured. Under the No Action Alternative, TVA would not purchase the power generated by the Project under the 20-year PPA with SR Innovation, LLC (i.e., TVA would not be involved with the Project), and the solar facility would not be constructed and operated by SR Innovation, LLC. Existing conditions in the project area would likely remain unchanged, at least in the near-term, and field and forestry management practices maintained by the current property owner, Belz Enterprises, would likely continue. TVA would continue to rely on other sources of generation described in the 2015 IRP (TVA 2015) to ensure an adequate energy supply and to meet its goals for increased renewable energy and low greenhouse gas (GHG) emitting generation.

2.2 PROPOSED ACTION ALTERNATIVE

Under the Proposed Action Alternative, TVA would enter into the 20-year PPA with SR Innovation, LLC, who would construct and operate the 2-MW DC SR Innovation single-axis tracking PV solar power facility located approximately 10 miles northeast of downtown Memphis in Shelby County, Tennessee. Developed portions of the proposed SR Innovation solar facility would occupy 11.2 acres of the project site. Another 19.4 acres of the project site would be cleared of trees and maintained as grass. The 45-acre project site is part of a 132-acre parcel owned by Belz Enterprises; SRC would subdivide and purchase one parcel totaling 31 acres. SRC has acquired the rights to clear trees from an adjacent 14-acre portion of the 132-acre parcel east of the SRC-owned parcels in order to remove trees that would shade the solar facility. Approximately 150 to 200 feet of vegetative growth surrounding the solar panels would be cleared as shade control. The proposed facility would connect to the existing 12.47-kV MLGW powerline along the southern boundary of the project site. This EA assesses the impact of TVA's action to enter into the PPA with SR Innovation, LLC and the associated impact of the construction and operation of the proposed solar facility and electrical interconnection by SR Innovation.

2.2.1 Solar Facility

The solar facility would be constructed on a 45-acre tract that is partially forested and partially open-field tract and located approximately 10 miles northeast of the Memphis city center. As

described above, the tract is composed of 31 acres that would be owned by SRC and leased to SR Innovation, LLC, and one partial parcel totaling 14 acres that would remain owned by Belz Enterprises. Approximately 6.6 acres at the southern end of the project site have been cleared of trees and are now vegetated in grasses and herbaceous plants, while the remaining 38.6 acres are forested and currently maintained through forestry management practices (Figure 2-1). A segment of the Canadian National Railroad forms the western property boundary.

Figure 2-1. Aerial photograph showing the SR Innovation project site boundary.

The project site is located west of New Allen Road and is currently accessible by an existing dirt road heading west from New Allen Road to an MLGW-owned electrical transmission line right-of-way oriented north-south to the east of the project site. The project site is bounded on the north by Point Church Road and to the south by the Nike NALC-Memphis campus. The proposed solar facility would connect to the existing MLGW-owned 12.47-kV powerline located along the southern boundary of the project site (Figure 2-1).

The SR Innovation solar facility is proposed to be developed on approximately 11.2 acres of the 45-acre project site, including 11 acres with perimeter security fencing and approximately 0.2 acre of access roadway outside of the fence (Figure 2-2). The 11.2-acre area to be developed would be cleared of vegetation and graded as needed to produce relatively level ground across the area. The 11-acre fenced area would contain solar arrays, the majority of the one access road, and some electrical infrastructure. Buffers at least 25 feet wide, where tall vegetation would be removed through non-mechanical means and the root mat, left in place, would be maintained

adjacent to streams, wetlands, and wet weather conveyances (WWCs). The Project access road would cross a wetland, which would require light grading and the installation of a culvert. Approximately 1.1 acre of the overall 11.2-acre facility footprint would be covered with gravel for roadway use. Another approximate 19.4 acres of the 45-acre project site outside of the fenced-in area would be cleared of vegetation, graded as needed to produce relatively level ground, and maintained in grass. Following clearing of tall vegetation, an estimated minimum 50-foot perimeter of trees would surround the project site except in the extreme southern portion.

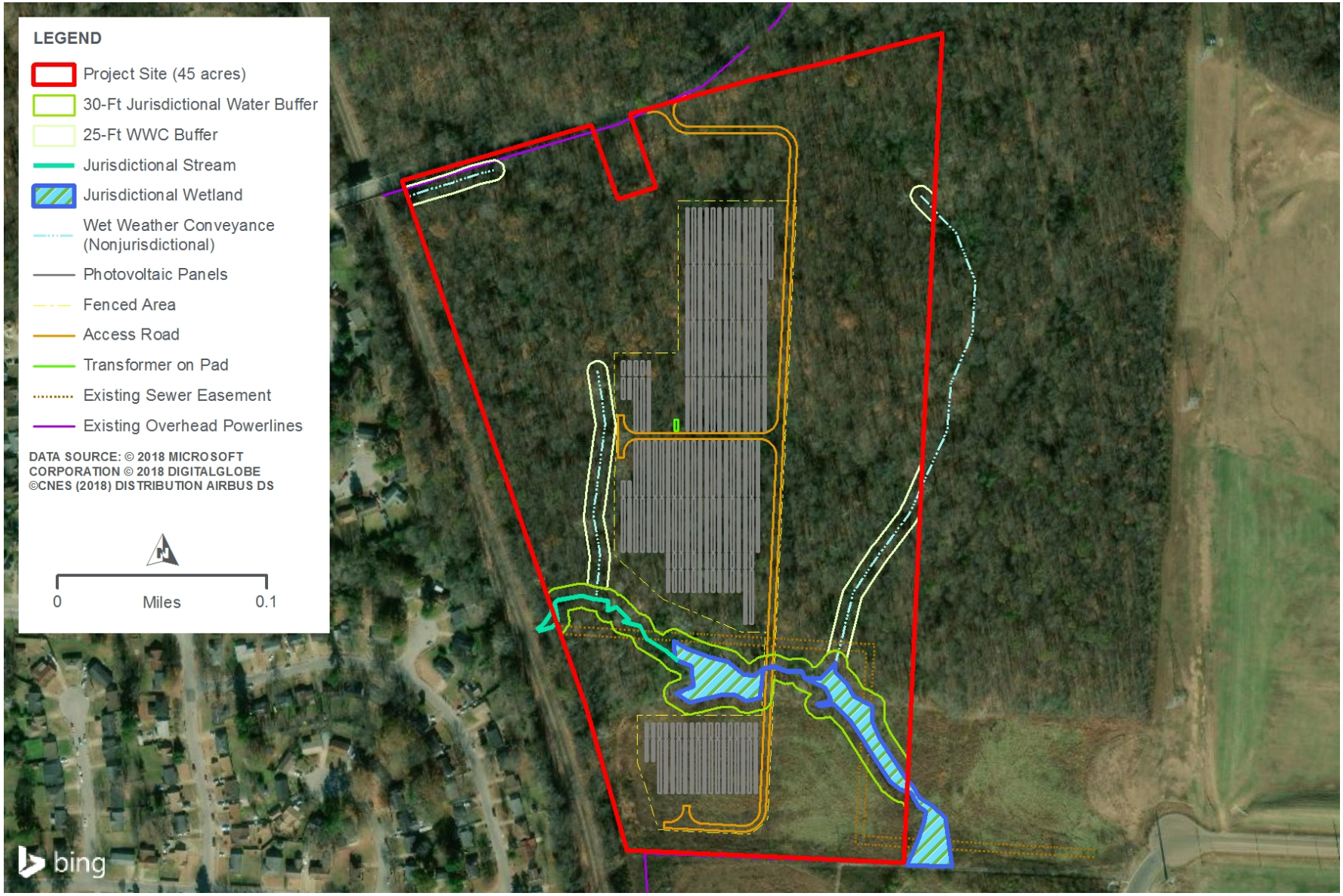


Figure 2-2. Aerial photograph showing the proposed layout of the SR Innovation solar facility components.

The solar arrays utilized for the Proposed Action would be composed of multiple monocrystalline PV modules, or panels. 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). This Project would convert sunlight into DC electrical energy within monocrystalline PV panels (Figure 2-3).

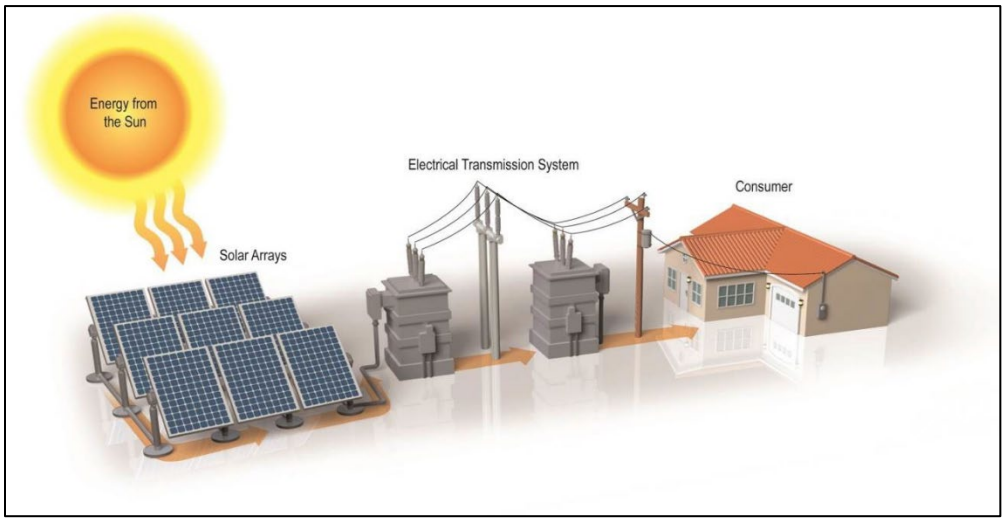


Figure 2-3 General energy flow diagram of PV solar system (not to scale).

The SR Innovation solar facility would be composed of approximately 5,454 PV panels, each capable of producing approximately 360 watts, mounted together in arrays (Figure 2-3). The arrays would connect to a total of 28 1,500V power inverters, and one 2.00-mega volt amp (MVA) transformer to convert the DC electricity generated by the solar panels into AC electricity for transmission across the Project's electrical collection system and to an on-site power pole connecting to the MLGW distribution system.

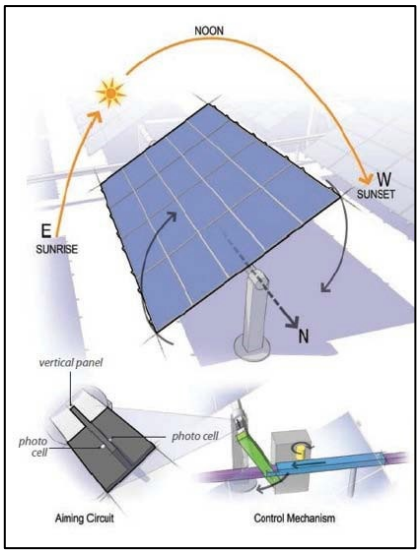


Figure 2-4 Diagram of single-axis tracking system (not to scale).

The PV panels would be mounted on motor-operated axis tracker structures, commonly referred to as single-axis trackers. The axis trackers 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. The tracker assemblies would be constructed in parallel north-south rows using steel piles installed using either a vibratory pile driver or helical piles with a depth of 6 to 10 feet below grade (Figure 2-4).

The PV modules would be electrically connected in series (called a "string") by wire harnesses that conduct DC electricity to combiner boxes. Each combiner box would collect power from a total of 202 strings of modules and feed a power conversion station via cables placed in excavated

trenches. The trenches would be approximately 4.7 feet deep and 2 feet wide. Each trench would be backfilled with project-site native soil and then appropriately compacted. Aboveground cables would be used to connect the modules to harnesses that lead wiring to combiner boxes.

The AC current from each individual inverter would be transformed into the AC collection voltage, typically 25 kV. The underground voltage collection circuits would deliver AC electricity from the single transformer to the project's on-site power pole connecting to the existing MLGW overhead powerline.

The PV panels would be installed in parallel north-south rows and arranged to largely avoid streams and wetlands on the project site to the maximum extent practicable. The arrays would contain an inverter and approximately 87 trackers of panels (Figure 2-3 and Figure 2-4). Buried electrical cables would connect the rows of PV panels to 1,500V power inverters, each connecting to the single pad-mounted 2.00 MVA transformer on site. The buried cables would continue from this transformer to the on-site point of interconnection and would require excavation of one trench in a wetland. As described above, all trenches for buried cables on the site, including the one required trench in a wetland, would be backfilled with native soil, and the ground surface would be returned to its original grade. The Project would connect to a new on-site pole and interconnect with the existing MLGW 12.47-kV distribution line already in place. The new pole would be constructed and owned by SR Innovation, LLC. The 2-MW DC site would produce 1.40-MW AC of energy output that would be sold to TVA.

2.2.2 Construction

Construction of the solar power facility generally requires site preparation (surveying and staking, removal of tall vegetation and small trees, light grading and clearing, installation of security fencing, installation of erosion 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 system testing and verification.

SRC's standard practice, which would be employed by SR Innovation, is to work with the existing landscape (e.g., slope, drainage, utilization of existing roads) where feasible to minimize or eliminate grading work to the greatest 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, native topsoil would be removed from the area to be graded and stockpiled on site for redistribution over the disturbed area after the grading is completed. Silt fence, sedimentation basins, and other appropriate controls would be used, as needed, to minimize exposure of soil and to prevent eroded soil from leaving the work area. Disturbed areas would be seeded post-construction using a mixture of certified weed-free, low-growing native grass seed obtained from a reputable seed dealer and in compliance with the requirements established by the local office of the Natural Resource Conservation Service (NRCS). 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 and compaction of earth to meet the final design requirements. Due to the existing topography of the site and the use of single-axis tracking, cut-and-fill grading activities would be required to achieve the final design and maximum slope criteria. Grading at the site is expected to result in a net zero balanced cut-and-fill quantity of earthwork to the extent practical and therefore not require any off-site or on-site hauling. Within the 45-acre project site, approximately 30.6 acres is proposed for the solar facility and associated shade control. These approximately 30.6 acres would be cleared and graded by the selected construction contractor (see Figure 3-2) to prevent shading of the solar panels and for construction and placement of the solar panels, gravel access roads, 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. The remainder of the 45-acre area would require minimal clearing. In accordance with TDEC requirements, a minimum 25-foot buffer width surrounding all streams and wetlands would be established as an avoidance measure prior to any clearing, grubbing, or grading activities conducted by the construction contractor. Apart from removal of tall vegetation through non-mechanical means and leaving the roots in place, these buffered areas would be avoided during construction to the greatest extent practicable. Construction would take place in wetlands that cannot be practicably avoided in accordance with the authorization provided under Sections 404 and 401 of the Clean Water Act. Once sensitive 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, sediment traps and erosion control silt fence would be utilized. 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 the entire 30.6-acre area to be cleared. These stormwater BMPs would prevent sediment from entering on-site streams and wetlands and prevent sediment migration off site.

Corrugated metal pipe (CMP) that is no larger than 48-inches in diameter would be installed at one location in a linear wetland to provide road access throughout the solar facility while maintaining water movement during and after construction.

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage during construction. This area would be on site for the duration of construction. Temporary construction trailers used 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 site. No operations and maintenance buildings or other permanent structures would be on site.

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 the 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 would be 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. Typical installations of this type are constructed using steel support piles. The driven steel pile foundation is 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 with temporary disturbance from the hydraulic ram machinery, which is about the size of a small tractor. Screw piles are another option for PV foundations which are driven into the ground with a truck-mounted auger. Screw piles create a similar soil disturbance footprint as driven piles.

Solar panels would be manufactured off site and shipped to the site ready for installation. If concrete pads are required for the drive motors they would be precast and brought to the site via flatbed truck. Once the majority of the components are placed on their respective foundations and structures, electricians and other workers would run the electrical cabling throughout the solar field.

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

The proposed Project would include a new on-site power pole connection to the existing MLGW distribution line. The SR Innovation-owned connection would exit the site via an overhead line and connect to an existing 12.75-kV line.

Within the 45-acre solar facility site, the 11-acre area containing the solar arrays, associated electrical infrastructure, and access road would be securely fenced during construction and for the duration of the Project operation with 7-foot-high chain-link fencing with three strands of barbed wire on the top. The site would be accessed from Point Church Road, where a new access road would lead south to a security gate at the fenceline. Construction activities would take approximately 4 months to complete using a crew of approximately 40 to 50 people at the peak of construction. Work would generally occur 6 days per week (Monday through Saturday) from 7 am to 3:30 pm. Additional hours could be necessary to make up schedule deficiencies or to complete critical construction activities.

2.2.3 Project 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 1-degree angle every few minutes. This movement is barely perceptible. In the late afternoon, module rotation would start to backtrack west to east in a similar slow motion to minimize shading. At sunset the modules would track to a flat stow position. Otherwise, the PV modules would simply collect solar energy and transmit it to the MLGW power grid. With the exception of fence repair, vegetation control, and periodic array inspection, repairs, and maintenance, the facility would require relatively little human activity during operation. No water or sewer service, or permanent lighting would be required on site during operations.

The project site would not be staffed during operation; however, inspection and maintenance is required biannually and in the case of equipment failures. At these times, up to 4 people would be on site for up to 4 days. Biannual inspections would involve drawing transformer oil samples and identifying any physical damage to panels, wiring, and interconnection equipment. Vegetation on the site would be maintained to control growth and prevent shading of the PV panels or interference with the tracking mechanisms. Traditional trimming and mowing would be performed on a quarterly basis, depending on growth rate to maintain the vegetation. Selective use of spot herbicides may also be employed around structures to control any invasive weed outbreak. Precipitation in this 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 project 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 under a PPA with TVA for the first 20 years of its life. At the end of the PPA, the Project staff and SR Innovation, LLC would assess whether to cease operations at the project site or enter into a new power purchase contract or other arrangement. If TVA or another entity is willing to enter into such an agreement, the Project could continue operating. If no commercial arrangement is possible, then the facility would be decommissioned and dismantled, and the site would be restored. In general, the majority of the decommissioned equipment and materials would be recycled. Materials that cannot be recycled would be disposed of at an approved facility.

2.3 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 Shelby 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 2.3-1.

Table 2.3-1. Comparisons of impacts by alternative.

Resource	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Land Use	No direct impacts anticipated. Indirect adverse impacts are possible as undeveloped land could be developed over the long term. Indirect positive impacts may also result as the forested land matures and creates additional habitat.	Minor direct adverse impacts. Land use on the project site would change from undeveloped to industrial. The surrounding area, however, is a mixture of residential, undeveloped, and industrial land, which would not change. No indirect impacts.
Geology and Soils	No direct impacts anticipated. Indirect adverse impacts are possible as undeveloped land could be developed over the long term and cause soil erosion and runoff.	Minor direct adverse impacts related to erosion and sedimentation during construction. No indirect impacts anticipated.
Water Resources	No direct impacts anticipated. Indirect adverse impacts are possible if forestry management practices continue without BMPs and cause runoff that could affect water resources.	**Groundwater**: No direct or indirect adverse impacts anticipated. **Surface Water:** Minor permanent direct adverse impacts (one wetland road crossing with grading and culvert affecting 0.0005 acre of wetland). With use of BMPs, minor temporary direct adverse impacts during construction, including temporary impacts to 0.0005 acre of wetland from trenching.

Resource	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Biological Resources	No direct impacts anticipated. Potential indirect beneficial impacts if the site remains undeveloped and matures over time.	**Vegetation:** Minor direct adverse impacts associated with long-term removal of trees and shrubs, grading, and conversion of forest to permanent grass-herbaceous vegetation. No indirect impacts anticipated. **Wildlife:** Minor direct adverse impacts associated with displacement of wildlife during site clearing and grading and conversion of site to permanent grass-herbaceous vegetation cover. No significant indirect impacts expected. **Rare, Threatened & Endangered Species:** No direct effects to federally listed species. Indirect effects to federally listed Indiana bat and northern long-eared bat due to minor loss of low quality roosting and foraging habitat and minor impacts to water resources. However, actions would not adversely affect the Indiana bat or the northern long-eared bat. Potential minor direct effects to the barn owl due to minor breeding and foraging habitat loss.
Visual Resources	No direct impacts anticipated. Potential indirect impacts to visual resources as the area alters due to population growth and/or land use changes.	Minor temporary direct and indirect adverse impacts during construction related to vegetation removal and use of heavy equipment. Moderate direct visual impacts in the immediate area, particularly to the south and southeast of the site; no significant impacts over a larger scale due to tree buffers.
Noise	No direct or indirect impacts anticipated.	Minor temporary direct and indirect adverse impacts during construction. Negligible adverse impacts associated with operation.
Air Quality and Greenhouse Gas Emissions	No direct or indirect impacts anticipated.	Minor temporary direct adverse impacts during construction. No direct or indirect impacts associated with operation.

Resource	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Cultural Resources	No direct or indirect impacts anticipated.	No direct or indirect impacts anticipated.
Solid and Hazardous Waste	No direct or indirect impacts anticipated.	No significant direct or indirect adverse impacts anticipated with the use of BMPs.
Transportation	No direct or indirect impacts anticipated.	Minor temporary direct adverse impacts during construction. No direct or indirect impacts anticipated during operation.
Socioeconomics	No direct or indirect impacts anticipated.	Minor positive, long-term direct impacts from the Project. The local job opportunities and tax base would increase from construction of the solar facility and would be most beneficial to the Shelby County area.
Environmental Justice	No direct or indirect impacts anticipated.	No direct or indirect impacts anticipated due to overall minor direct and indirect impacts from the Project.

2.4 MITIGATION MEASURES

SR Innovation, LLC would implement the following minimization and mitigation measures in relation to resources potentially affected by the Project:

- Land use and visual resources
  - Maintain tree buffers on the eastern, western, and northern boundaries of the project site;
- Geology and soils
  - Placement of silt fence along the perimeter of the vegetation-cleared area and balance cut-and-fill quantities to alleviate the transportation of soils off-site during construction,
  - Implement soil stabilization and vegetation management measures to reduce the potential for soil erosion during site operations;
- Water resources
  - Comply with the terms of the SWPPP prepared as part of the NPDES permitting process and implement other routine BMPs, such as nonmechanical tree removal within surface water buffers, placement of silt fence and sediment traps along buffer edges, and proper vehicle maintenance to reduce the potential for adverse impacts to groundwater; and
- Transportation
  - Consider staggered work shifts and posting a flag person during the heavy commute periods to manage traffic flow to and from the project site.

2.5 THE PREFERRED ALTERNATIVE

The TVA-preferred alternative for fulfilling its purpose and need is the Proposed Action Alternative. Under this alternative, TVA would enter into a 20-year PPA with SR Innovation, LLC. SR Innovation, LLC would then construct and operate the proposed 2-MW DC single-axis tracking PV solar power facility. The preferred alternative (Proposed Action Alternative) would produce renewable energy for TVA and its customers with only minor environmental impacts, some environmental benefits, and would help meet TVA's renewable energy goals. The Proposed Action Alternative would also assist Nike in meeting its renewable energy goals by 2025.

This page intentionally left blank.

CHAPTER 3

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

3.1 LAND USE

This section describes an overview of existing land use at and surrounding the project site 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. Shelby County and the City of Memphis share the Division of Planning and Development (DPD), which develops zoning ordinances and planning documents to control development and concentrate similar land uses in the city and county (Shelby County 2018). The project site is within the Memphis city limits and has the local zoning designation “EMP, Employment” indicating an area designated for employment uses (City of Memphis 2018a). According to the Memphis and Shelby County Unified Development Code, “the EMP District is intended to accommodate office, light manufacturing, research and development, warehousing, wholesale, processing and commercial uses in order [to] promote economic viability, encourage employment growth, and limit the encroachment of non-industrial development within established industrial areas” (Memphis and Shelby County 2010). Some civic, most commercial and industrial, and all agricultural uses are permitted in EMP zoned areas, and solar farms are specifically permitted in areas zoned EMP. Images generated with the National Land Cover Database (NLCD) Evaluation, Visualization, and Analysis Tool show the project site as primarily deciduous forest with scattered evergreen forest and scrub/shrub coverage (Figure 3-1) (NLCD 2016).

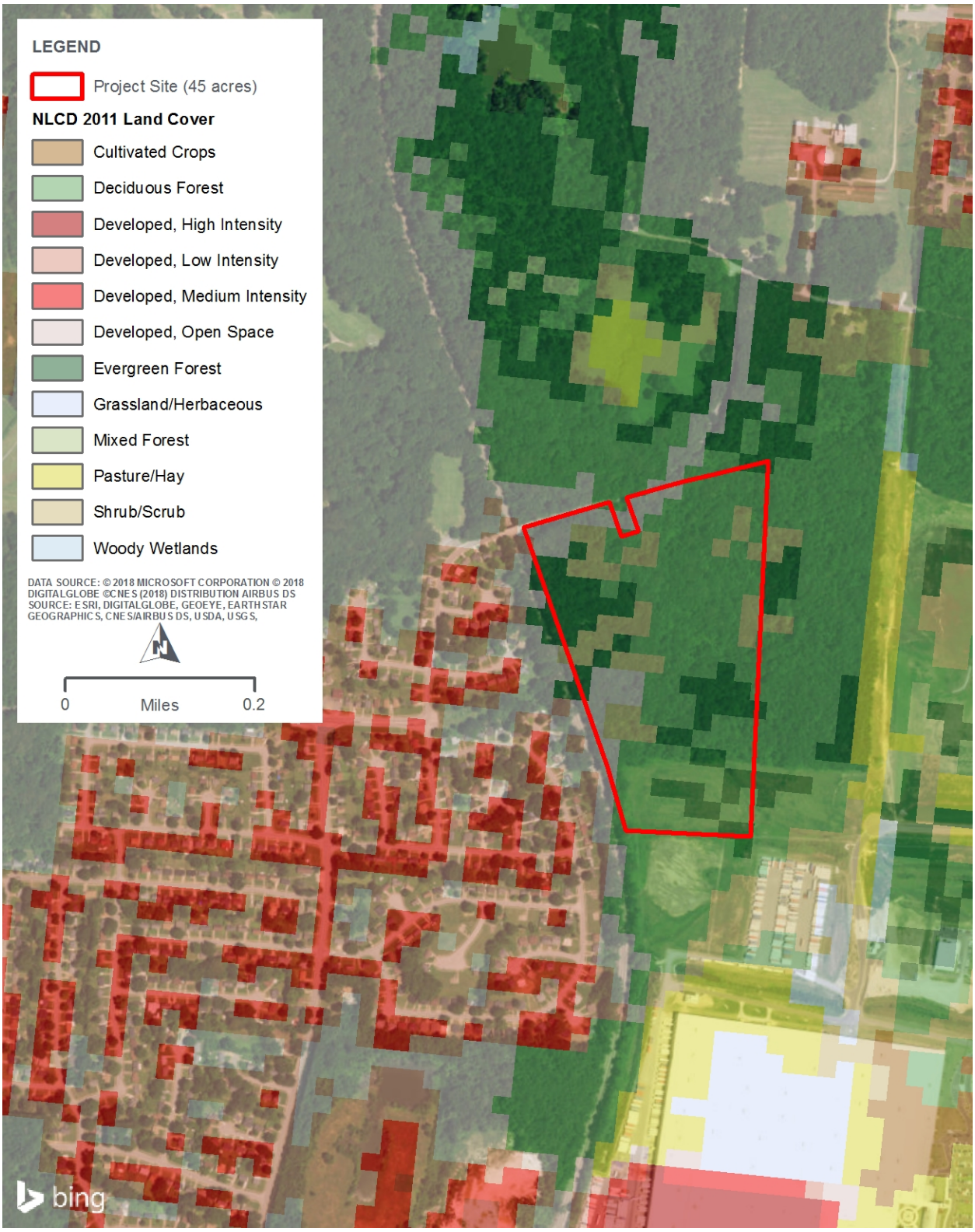


Figure 3-1. Land cover on the solar facility site and adjacent area.

The project site is approximately 300 feet above mean sea level (amsl) and consists of relatively flat to gently sloping terrain. Elevation is highest on the northern section of the site, decreasing to

the lowest elevation at the southern half of the site. Presently, approximately 15 percent of the project site is open field, while the remaining approximate 85 percent of the site is predominately forested in hardwoods. As shown in Figure 3-2, a portion of the understory of the forested area was cleared and bulldozed, herein referred to as “grubbed,” by the current property owner as part of an on-going forestry operation. Available historical aerial photographs and topographic quadrangles document that land use of the project site remained relatively unchanged since the early 1990s (US Department of Agriculture [USDA] 1971, 1980, 2007, 2010, 2014; USGS 1973, 1986, 1990, 1992, 1997). Prior to the 1990s, the project site and surrounding vicinity were primarily utilized as agricultural and rural-residential land. The residential subdivision west of the project site was developed by the early 1970s.

An electrical transmission line corridor is located east of the project site, and the Canadian National Railroad forms the western boundary of the project site. The Nike NALC-Memphis campus is adjacent to the project site to the south, and Point Church Road forms the site’s northern boundary. Industrial development dominates to the south; undeveloped, forested or cleared land dominates to the north and east; and residential development dominates to the west and more generally in all directions as distance from the project site increases. Two City of Memphis parks are in the vicinity of the project site, including the Links at Davy Crockett, a golf course, to the northwest and Willingham Park, a community center, to the southeast. These are 1.5 and 2 miles from the project site, respectively.

Figure 3-2. Portion of the forested area where the understory was grubbed by the current property owner

3.1.2 Environmental Consequences

This section describes the potential impacts to land use should the Proposed Action or No Action Alternative 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 use would be expected to remain primarily undeveloped land.

Indirect impacts in land use under the No Action Alternative are possible as the City of Memphis grows. If the area population grows significantly, the project site could become developed. Alternately, positive indirect impacts could result if the project site continues as undeveloped land and transitions to mature forest over time, providing habitat to an increased diversity of plants and animals.

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 45-acre project site from undeveloped to industrial. Since the project site is zoned Employment, the development of the project site as a solar facility is compatible with its current land use zoning. Existing industrial land use is adjacent to the south of the project site. The addition of the solar facility would result in an expansion of industrial land use to the north, where undeveloped land currently dominates. The surrounding area to the north is currently a mixture of undeveloped land and residential developments. The majority of this land is zoned for residential and employment uses. Development of currently undeveloped land in the vicinity of the project is likely to continue over the next 20 years in accordance with current zoning. Following decommissioning of the solar facility, the project site could return to its current land use. The area of the project site to be leased by SR Innovation but not developed as a solar facility would remain cleared and maintained, though vacant, in the northwestern portion.

Since the Project is located on undeveloped forested land and there are no outdoor recreation areas in the immediate vicinity, development of the solar facility and distribution line would have no impact on public recreation activities or facilities. The activities associated with the Proposed Action would not have any indirect effects on land use.

3.2 GEOLOGY AND SOILS

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. Components of geological resources that are analyzed include geology, geological hazards, and soils.

3.2.1 Affected Environment

The project area is located within the Loess Plains Level IV physiographic ecoregion, which is part of the larger Mississippi Valley Loess Plains Level III ecoregion oriented north-south between

western Kentucky and eastern Louisiana (Taylor 2016; USGS 2018a). The Mississippi Valley Loess Plains are generally situated east of the Mississippi River and associated bluffs. The topography of this ecoregion is characterized by irregular plains interspersed with gently rolling hills. A thick layer of wind-transported, fine-grained quartz and other minerals, known as loess, underlies acidic, fine-textured soils that are erodible and generally low in organic matter. In the Loess Plains Level IV ecoregion, upland forests of oak, hickory, and pine typically dominate. Tertiary-age sand, silt, clay, and gravel compose the Loess Plains (TDEC 2018a). The nearest earthquake hazard area is in northwestern Tennessee, along the Mississippi River where Tennessee and Missouri converge, over 50 miles north of the project site (Figure 3-3; USGS 2018b).

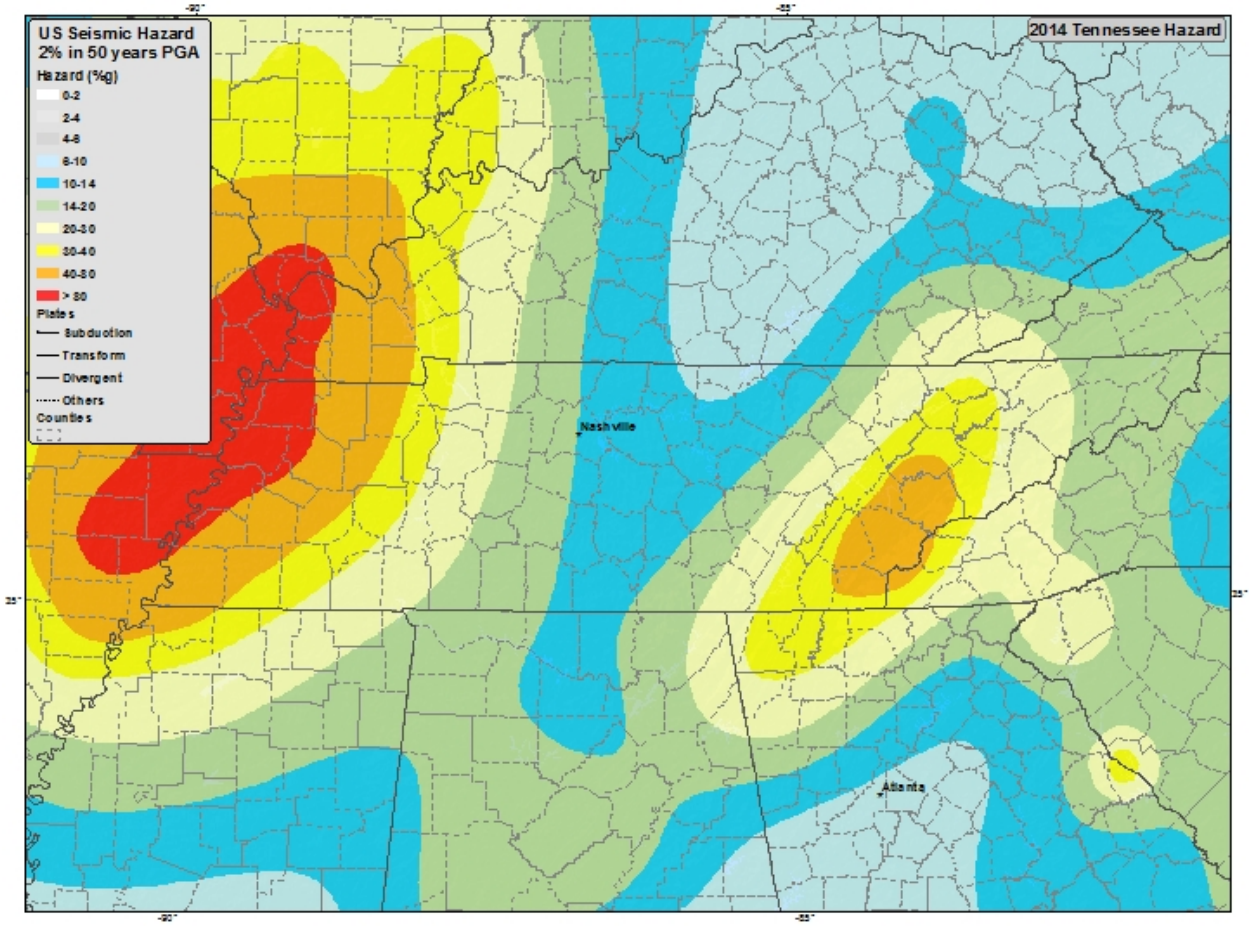


Figure 3-3. Closest seismic hazard areas to the project site (USGS 2014).

Elevations at the project site range from approximately 240 feet to 340 feet amsl with topography gently sloping to the south. The site is characterized by moderately gentle draws where water collects and drains to the south, toward a perennial stream and wetland.

Table 3.2-1 and Figure 3-4 summarize the soil types on the site as defined by the USDA NRCS Soil Survey Geographic database (USDA 2018a). A hydric soil is a soil that is, "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (*Federal Register*, July 13, 1994). NRCS's Hydric Soils

List classifies Falaya silt loam (Fm) as hydric for Shelby County, Tennessee. No other soils within the project site are considered hydric.

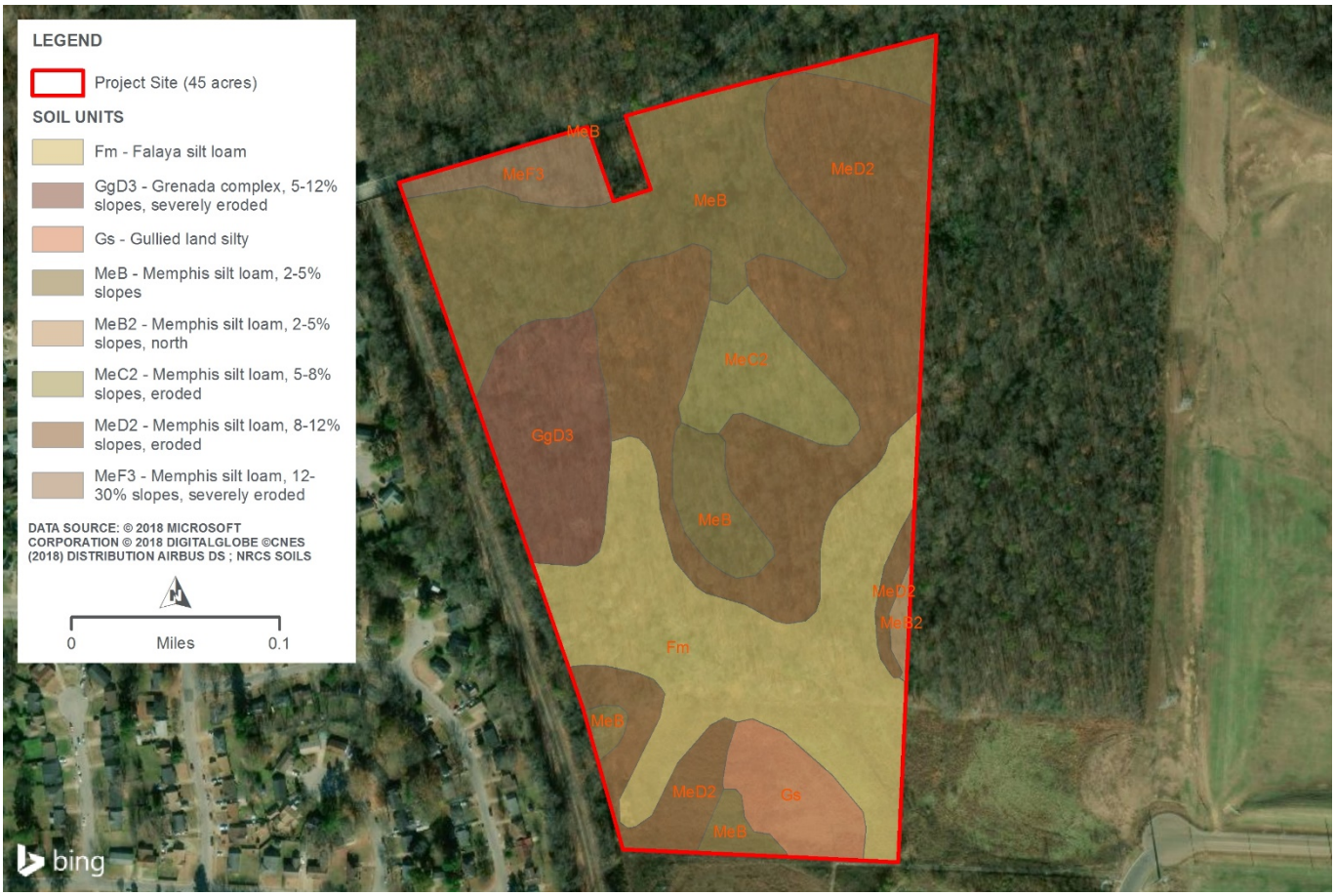


Figure 3-4. Soils on the project site.

The Farmland Protection Policy Act (FPPA) is intended to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of important farmland to nonagricultural uses (USDA 2012). The FPPA applies to lands designated as important farmlands as either prime farmlands or farmlands of statewide importance. However, lands identified as an urbanized area by the US Census Bureau (USCB) are not subject to the FPPA. The project site is within the Memphis, TN-MS-AR urbanized area and is therefore not subject to the FPPA (USCB 2018).

Table 3.2-1. Soils on the project site.

Soil type	Hydric rating	Area (acres)	Percentage of project site
Memphis silt loam, 8 to 12 percent slopes, eroded (MeD2)	(none)	14.7	32.5

Soil type	Hydric rating	Area (acres)	Percentage of project site
Memphis silt loam, 2 to 5 percent slopes (MeB)	(none)	10.5	23.3
Falaya silt loam (Fm)	2	10.4	23.0
Grenada complex, 5 to 12 percent slopes, severely eroded (GgD3)	(none)	3.8	8.3
Memphis silt loam, 5 to 8 percent slopes, eroded (MeC2)	(none)	2.4	5.3
Gullied land silty (udorthent, silty) (Gs)	(none)	1.9	4.2
Memphis silt loam, 12 to 30 percent slopes, severely eroded (MeF3)	(none)	1.3	2.8
Memphis silt loam, 2 to 5 percent slopes, north (MeB2)	(none)	0.2	0.5
		45.2	**100.0**

***Source*:** USDA 2018a

Western Tennessee was a shallow, tropical sea during the Cenozoic era. Significant paleontological resources are present in Middle and Eastern Tennessee regions near Nashville. However, Shelby County is not known for paleontological resources, and there is low likelihood that fossil remains are present (Paleontology Portal 2018).

3.2.2 Environmental Consequences

This section describes the potential impacts to geologic resources and soils should the Proposed Action or No Action Alternative 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 project-related impacts on geologic resources or soils would result. Existing land use would be expected to remain a mix of undeveloped, open-field and forested land.

Over time, indirect impacts to soils and geology could occur if the current land use practices change. If the project site were to be developed, changes to the soils on site would occur due to increased soil erosion and runoff. If timbering practices continued on the project site without proper conservation practices, soils could also erode, resulting in minor changes on the site. This degradation of soil quality could be minimized with proper forestry practices.

3.2.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to geology and soil resources would be anticipated as a result of construction and operation of the Project. Approximately 68 percent (30.6 acres) of land in the project site would be cleared and/or lightly graded for the solar facility.

The site grading and clearing for the solar facility would cause minor impacts to geology and soils including minor, localized increases in erosion and sedimentation.

Geology

Under the Proposed Action, minor impacts to geology could occur. The solar arrays would be supported by steel piles either driven or screwed into the ground to a depth of 6 to 12 feet, depending on soil qualities. If constructed, 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. Additional minor excavations would be required for the one transformer associated with the Project. One power pole pad is expected to be constructed to connect the arrays to the MLGW system. The pad would require some foundation work below the ground surface. Due to these minimal subsurface disturbances, minor direct impacts to potential subsurface geological resources are anticipated.

Geologic Hazards

Hazards resulting from geological conditions would be minor because the project site is in a relatively stable geologic setting; however, there is a moderate potential for small to moderate intensity seismic activity. The 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 project site would be unlikely to impact off-site resources.

Soils

As part of the site preparation and development process, approximately 11.2 acres of the project site would be developed. The project site could be temporarily affected during mowing and construction activities. Any stockpiled soils from the approximate 30.6-acre area where vegetation clearing and grading may occur would be replaced following cut-and-fill activities to the extent practical and therefore not require any off-site or on-site hauling of soils.

The Project layout plan 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 11.2-acre portion of the project site that would be developed or from off-site sources. The creation of new impervious surface, in the form of panel footings, the foundations for the inverter stations, and the power pole pad, would result in a minor increase in stormwater runoff and potential increase in soil erosion in limited areas. Use of BMPs such as soil erosion and sediment control measures would minimize the potential for increased soil erosion and runoff. Due to the Project disturbance area being at least 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 to reduce pollutants in stormwater discharges from the site. Following construction, implementation of soil stabilization and vegetation management measures would reduce the potential for erosion impacts during site operations.

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 may implement traditional mechanized landscaping using lawnmowers, weed eaters, etc. Traditional trimming and mowing would be performed periodically to maintain the vegetation at a height ranging from 6 inches to 2 feet. 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. These maintenance activities would not result in any adverse impacts to soils on the project site during operations.

3.3 WATER RESOURCES

This section describes an overview of existing water resources in and surrounding the proposed project site and the potential impacts on these water resources that would be associated with each alternative. Components of water resources that are analyzed include groundwater, surface water, and wetlands.

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 aquifers.

The aquifer underlying the project site is known as the Memphis aquifer and is composed of saturated portions of the formation known as the Memphis Sand (Parks and Carmichael 1990). The Memphis aquifer formation is part of a larger groundwater system known as the lower Claiborne-upper Wilcox aquifer and the middle Claiborne aquifer, both of which are parts of the Mississippi Embayment aquifer system (Parks and Carmichael 1990; USGS 2016b). The Cook Mountain Formation of the Claiborne Group overlies the Memphis Sand, and the Flour Island Formation of the Wilcox Group underlies it. The formation is composed of very fine to very coarse sand interspersed with lenses of silt and clay at varying depths, and its undisturbed thickness ranges from 400 to 900 feet. The Memphis Sand underlies approximately 7,400 square miles (4,736,000 acres) in western Tennessee.

Groundwater recharge of the Memphis Sand is primarily from precipitation on the outcrop or by infiltration of water from overlying fluvial deposits and alluvium (Parks and Carmichael 1990). Groundwater flow in this aquifer system generally conforms to subsurface topography. From the outcrop and recharge belt, located in Carroll, Fayette, Hardeman, Henry, and Madison counties, the potentiometric surface generally slopes westward, slowly transporting water in that direction. Water composition in the Memphis aquifer generally includes calcium bicarbonate, sodium bicarbonate, or a mixed type and contains low concentrations of most major constituents typically present in groundwater. Water quality in the aquifer is generally suitable for most uses, 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.

Public and industrial supply well yields vary from 10 to 2,300 gallons per minute (Parks and Carmichael 1990). In 1983, fresh groundwater withdrawals from the Memphis aquifer averaged 227 million gallons per day (mgd), 80 percent of which was withdrawn from the City of Memphis vicinity. In 2001, withdrawals totaled approximately 200 mgd of groundwater (Brahana and Broshears 2001). In 2016, TDEC estimated that the City of Memphis withdrew approximately 136 mgd on average, over 87 percent of total withdrawals for Shelby County and approximately 68 percent of total withdrawals from the Memphis aquifer system (TDEC 2016). Withdrawal rates for the City of Memphis are more than 2.3 times the state average of approximately 58 mgd. TDEC lists Shelby County as one of several Tennessee counties experiencing emerging water conflicts and shortages.

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. Surface waters with certain physical and hydrologic characteristics 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 of the Act. The limits of Waters of the U.S. are defined through a jurisdictional determination made by USACE. TDEC has jurisdiction over water quality in Tennessee.

The proposed project site is located in the Loosahatchie River Watershed (Hydrologic Unit Code [HUC]-8 digit 08010209), which encompasses portions of Shelby, Fayette, Hardeman, Haywood, and Tipton counties (USGS 2018c, 2018d; TDEC 2003). Part of the Mississippi River Basin, the watershed spans approximately 738 square miles and contains approximately 1,443 stream miles and 81 lake acres (TDEC 2003). The Loosahatchie River begins east of Somerville, Tennessee and flows in a westerly direction to a confluence with the Mississippi River southwest of Millington, Tennessee, and north of Memphis.

Within the Loosahatchie River Watershed, the project site is located in the National Hydrography Dataset (NHD) HUC-10 digit subwatershed 0801020904 and the smaller NHD HUC-12 digit subwatershed 080102090406 called the Loosahatchie River – Outlet (TDEC HUC-10 digit 0801020902 and HUC-12 digit 080102090206; USGS 2018c, 2018d; TDEC 2003). The Loosahatchie River – Outlet subwatershed occupies approximately 58 square miles in Tennessee (USGS 2018c, 2018d).

On May 14 and 15, 2018, a wetland delineation and waterbody survey of the project site was conducted. The site will be revisited and the delineation verified by USACE. A Hydrologic Determination (HD) approval letter for the three on-site WWCs was issued by TDEC on August 27, 2018.

Waters of the U.S. were delineated according to the methodology and guidance described in the USACE 1987 Wetland Delineation Manual, USACE Post-Rapanos guidance, and the 2012 USACE Atlantic and Gulf Coastal Plain Regional Supplement (Version 2.0). Streams 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 (Version 1.4). Waters of the U.S. were flagged in the field and mapped using a Trimble® Geo7X Global Positioning System (GPS) unit capable of sub-meter accuracy. GPS points were post-processed utilizing Trimble® GPS Pathfinder Office software.

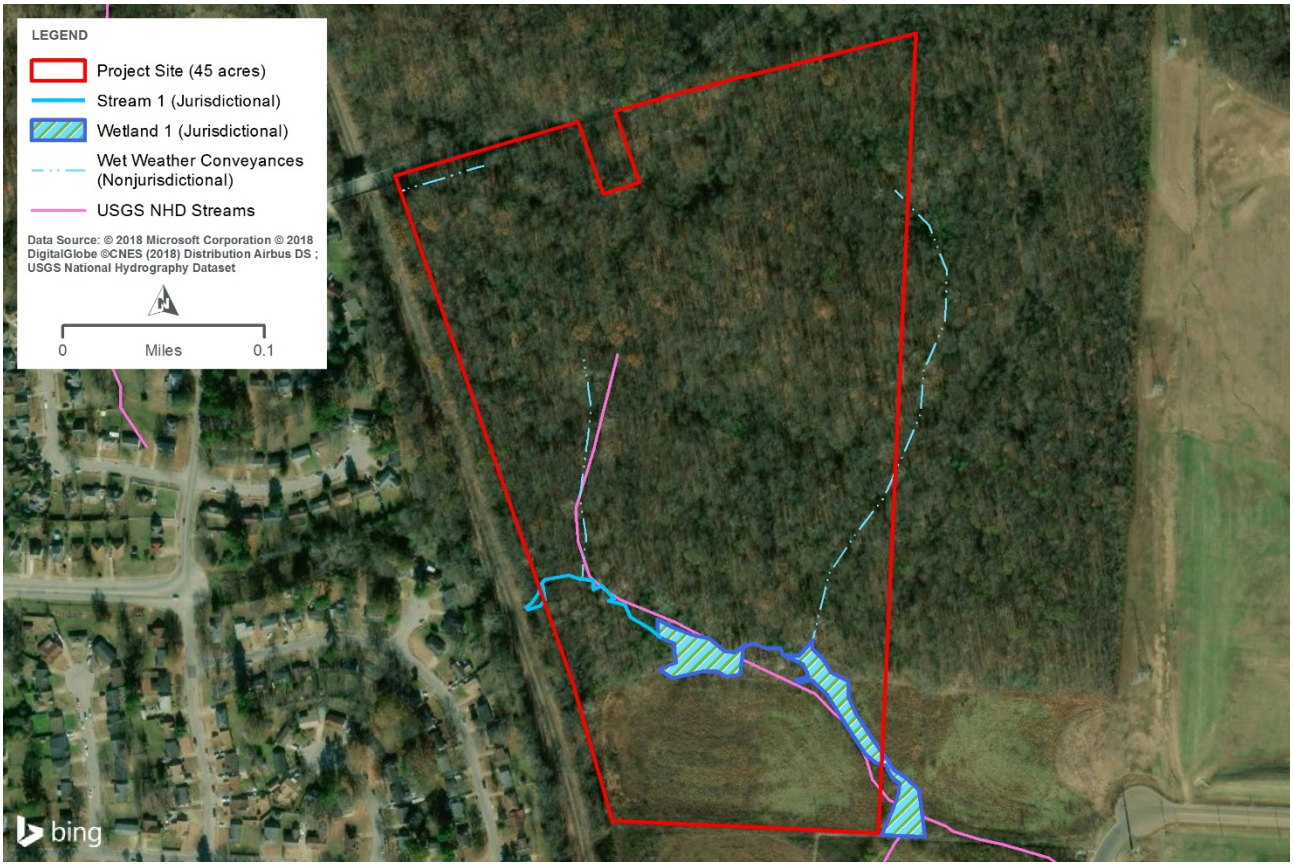


Figure 3-5. Aerial photograph showing wetlands and streams.

No waterbodies with special designations or listed impairments are on or near the project site. One stream channel (Stream 1) and one wetland (Wetland 1) were identified. The on-site surface waters drain to the Loosahatchie River within the Loosahatchie River – Outlet subwatershed. The on-site surface waters are classified for Fish and Aquatic Life, Recreation, Livestock Watering and Wildlife, and Irrigation uses by the TDEC Division of Water Resources Water Pollution Control. On-site non-wetland waters (Stream 1) total approximately 457 linear feet (0.04 acres) of jurisdictional stream channel (Figure 3-5 and Figure 3-6). There is one wetland located within the project site that consists of a forested portion and a shrub/scrub portion. On-site wetlands total approximately 0.80 acre. Three nonjurisdictional wet weather conveyances (WWCs, also referred to as swales) were identified within the project site and total approximately 1,361 linear feet on-site. The WWCs were determined not to meet jurisdictional wetland criteria nor did they meet the definition for classification as a jurisdictional stream.

Stream 1 exhibits varying levels of disturbance, including incision, bare banks, and sedimentation within the channel and would be considered a low quality channel. Stream 1 originates from an offsite culvert beneath the railroad in the southwest portion of the project site, and flows for approximately 457 linear feet before losing bed and bank characteristics within Wetland 1. Stream

characteristics indicate strong continuity of channel bed and bank, strong in-channel structure, strong sorting of substrate, moderate depositional bars or benches, strong grade control, moderate organic debris lines, and strong presence of amphibians and algae. Stream 1 is classified as a riverine, unknown perennial stream with an unconsolidated cobble-gravel bottom (R5UB1), according to the Cowardin Classification hierarchical structure (Cowardin et al. 1979). Ordinary High Water Mark (OHWM) indicators observed during the assessment include a clear, natural line impressed on the bank; vegetation matted down, bent, or absent; leaf litter disturbed or washed away; sediment deposition; the presence of wrack lines; and sediment sorting. Stream 1 is somewhat incised, exhibits bare banks with little stabilizing vegetation, and the substrate is embedded with non-native gravel.

WWC 1 originates in the west-central portion of the project site and drains south to Stream 1. WWC 2 originates in a northeast area of the project site, drains southeast offsite, then reemerges on-site draining south to Wetland 1. Lastly, WWC 3, originates in the northwest corner of the project site and drains west and continues offsite.

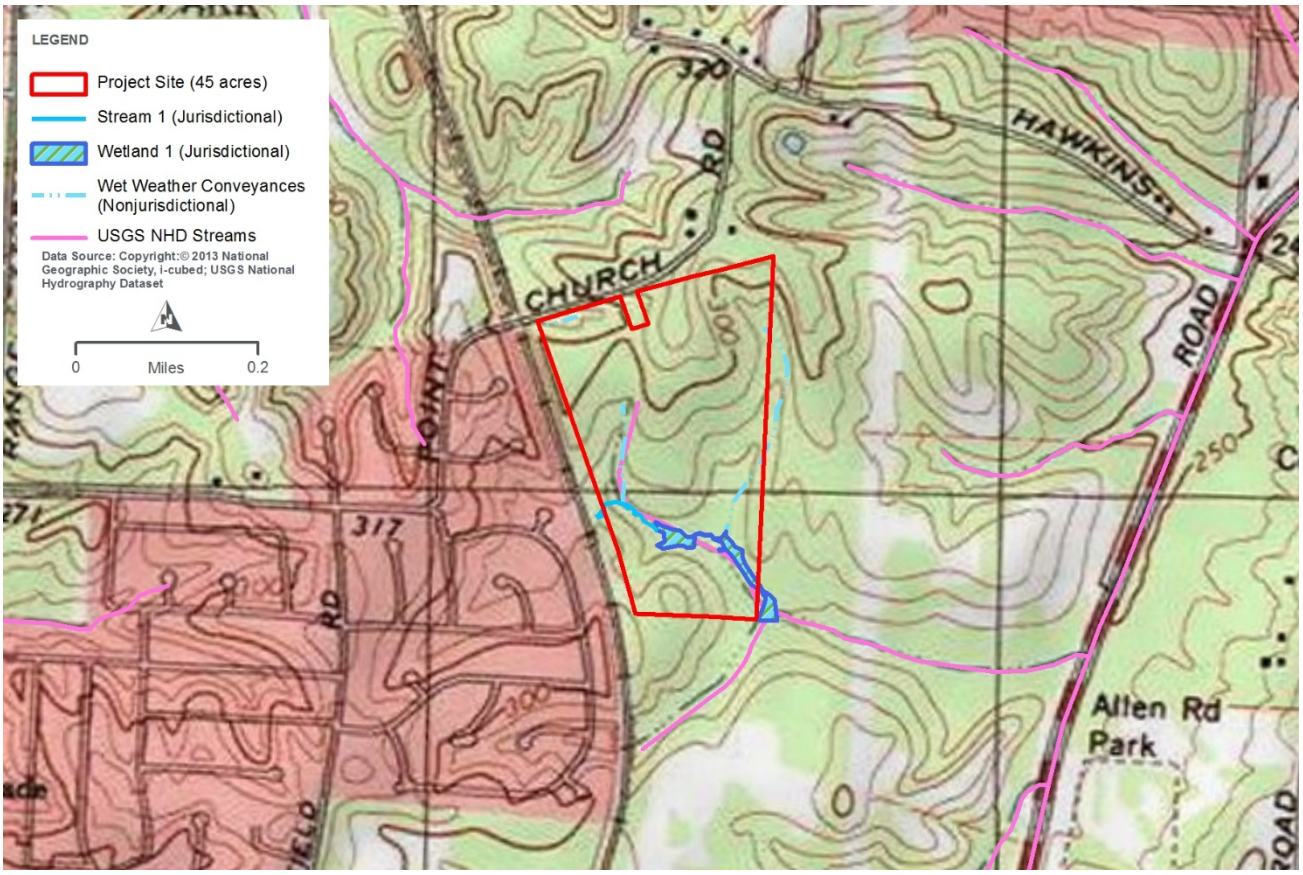


Figure 3-6. Topographic map showing wetlands and streams.

3.3.1.3 Wetlands

Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetlands with specific hydrologic, soil, and vegetation criteria are considered

Waters of the U.S. (or jurisdictional waters) and are under the regulatory jurisdiction of the USACE.

One wetland was observed within the project site during the wetland delineation site visit on May 14 and 15, 2018 (Figure 3-5 and Figure 3-6). From its emergence from Stream 1 in a forested portion of the project site, a portion of Wetland 1 was documented as palustrine and forested with broad-leaved deciduous trees (PFO1) (Cowardin et al. 1979). As it continues into the open field area of the project site, a portion of Wetland 1 was also identified as palustrine and vegetated by scrub/shrub, broad-leaved deciduous trees with saturation (PSS1B) (Cowardin et al. 1979). In the western, forested portion of Wetland 1, woody species are dominant and consist of sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and American sycamore (*Platanus occidentalis*). Nepalese browntop (*Microstegium vimineum*), an invasive grass, was present in the herbaceous stratum. However, at the time of the site visit, the understory had been recently grubbed for forestry management, and the understory and herbaceous strata were largely disturbed and absent. In the eastern, scrub/shrub portion of Wetland 1, tree and shrub species consisted of American sycamore, box elder (*Acer negundo*), sweetgum, black willow (*Salix nigra*), cottonwood (*Populus deltoids*), and green ash (*Fraxinus pennsylvanica*). Dominant species in the herbaceous stratum consisted of cattail (*Typha latifolia*), soft rush (*Juncus effusus*), giant goldenrod (*Solidago gigantea*), woodgrass (*Scirpus cyperinus*), jewelweed (*Impatiens capensis*), seedbox (*Ludwigia alternifolia*), and red maple seedlings. Primary and secondary wetland hydrology indicators observed during the delineation included surface water up to 2 inches, high water table to the surface, saturation up to 3 inches, drift deposits, algal mat or crust, aquatic fauna, surface soil cracks, drainage patterns, and crayfish burrows. Hydric soil indicators include a depleted matrix and a depleted matrix below a dark surface. The extent of jurisdictional features were verified by USACE on October 3, 2018, and the USACE letter concurring with the preliminary jurisdictional determination is provided in Appendix B.

3.3.1.4 Floodplains

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

Based on Flood Insurance Rate Map (FIRM) panel 47157C0280F (effective date of September 28, 2007) (FEMA 2018) shown in Figure 3-7, the entire project area is located outside the 100-year floodplain.

Figure 3-7. Flood Insurance Rate Map at project site.

3.3.2 Environmental Consequences

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

3.3.2.1 No Action Alternative

Under the No Action Alternative, the proposed 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 undeveloped, open-field and forested land, and water resources would remain as they are at the present time. Indirect impacts to water resources could result from the continuing use of the project site as forested land. Increases in erosion and sediment runoff could occur if logging practices were not maintained using BMPs. Erosion and sedimentation could alter runoff patterns on the project site and impact downstream surface water quality.

3.3.2.2 Proposed Action Alternative

Groundwater

No adverse impacts to groundwater would be anticipated as a result of the Proposed Action. Once installed, the solar facility and tree-cleared areas would occupy approximately 30.6 acres, and the total surface area of PV panels would be approximately 6.2 acres of the project site. The elevated panels would cover roughly 13.8 percent of the 45-acre project site; however, they would have relatively little 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 use of petroleum fuels, lubricants and hydraulic fluids during construction and by maintenance vehicles would result in the potential for small on-site spills. The use of BMPs to properly maintain vehicles to avoid leaks and spills and procedures to immediately address any spills that did occur, would minimize the potential for adverse impacts to groundwater.

Construction-related Water Needs

No water service is currently available at the proposed project site and no potable water would be available on site after 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 delivered by truck and would not adversely affect groundwater resources.

Operation and Maintenance-related Water Needs

The primary use 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). The internal access roads would not be heavily traveled during normal operations and consequently water use for dust control is not expected.

The precipitation in the area is adequate to minimize the 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 is identified and depending on the frequency of rainfall, proximity of arrays to sources of airborne particulates and other factors. This water would be brought on site in trucks for the specific purpose of panel cleaning and should not impact groundwater resources.

Decommissioning and Site Reclamation-related Water and Wastewater Needs

Because conditions can change during the course of the project life, a final Decommissioning and Closure Plan would be submitted to TVA for review and approval based on conditions as found at the time of facility closure.

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.

Due to the lack of groundwater use anticipated for the Project in comparison with the overall withdrawal rate for the Memphis aquifer of approximately 136 mgd (TDEC 2016), 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 operations or maintenance. Overall, no direct or indirect impacts to groundwater are anticipated.

Surface Water

During the facility design process, care was taken to avoid on-site jurisdictional streams and wetlands. However, complete avoidance was not feasible, and the construction and operation of the Project would permanently affect one wetland for a road crossing on the project site. The excavation of one trench for buried cables adjacent to the road crossing would temporarily affect the wetland.

Streams

Under the Proposed Action, no permanent direct adverse impacts to jurisdictional stream channels are expected to occur. Minor temporary direct adverse impacts during construction are anticipated with the use of BMPs to minimize sediment runoff during construction.

Wetlands

TVA is subject to EO 11990, Protection for Wetlands. EO 11990 states that unavoidable impacts to streams and wetlands should be compensated through a process known as compensatory mitigation. Moreover, a ‘no net loss of wetlands’ policy was first adopted as a national goal under George H. W. Bush’s administration in 1988. This policy aimed to balance wetland losses due to development with wetlands preservation and restoration efforts. This policy was further refined and endorsed by subsequent administrations, eventually resulting in the 2008 Final Compensatory Mitigation Rule regulations promulgated jointly by the USEPA and the USACE.

Under the Proposed Action, only minor impacts to wetlands are anticipated as the site layout for the project area was designed to avoid wetlands as practicable. Approximately 0.0005 acre of Wetland 1 would be permanently affected due to a road crossing. Another, likely partially overlapping 0.0005 acre of Wetland 1 would be temporarily affected due to excavation of a trench to install cables adjacent to the east of the proposed culvert. Because of grubbing of this area for forestry management practices by the current owner, Wetland 1 in the impact area is low quality and missing the understory layer. Wetland 1 at the site of the proposed road crossing and the proposed cable trench, adjacent to the east of the proposed road crossing, is linear in orientation and approximately 1-foot wide and 1-foot deep (see Figure 2-2). The installation of a pipe culvert for the road crossing would affect an approximate 20-foot length of linear wetland and would result in approximately 0.7 cubic yard of fill in the wetland. The trench for buried cables would temporarily affect an approximate 20-foot length of the 1-foot-wide and 1-foot-deep linear wetland,

or 0.0005 acre that likely overlaps with at least a portion of the permanently disturbed wetland acreage. During trenching, native soil would be side-cast temporarily and then replaced within the wetland. Due to implementation of BMPs to minimize sediment runoff during construction, only minor temporary direct adverse impacts during construction are anticipated.

In order for the Project to provide the proposed 2-MW DC output and do so in an economically viable manner, the site design cannot reasonably avoid the minor wetland impacts. Water resources on the project site are located across the east-west expanse, near the southern extreme of the project site and north of the point of on-site electrical interconnection (see Figure 2-2). Topography is less variable in the southern portion of the project site and would require less grading. In addition, locating the panels more southerly would allow for more trees to buffer the Project visually from Point Church Road and would shorten the distance to the point of interconnection. The shorter distance lessens the effects of "line loss" and allows for the inverters to transfer more power to the MLGW distribution line. Based on these factors, there is no practicable alternative to avoiding the minor wetland impacts. However, steps taken in designing the site layout for the project area have minimized the harm to wetlands. Therefore, this action is consistent with the requirements of EO 11990.

Cumulative Surface Water Impacts

Overall, runoff of sediment and pollutants could reduce surface water quality in the on-site stream and wetland during construction, and these potential impacts to surface waters would be minimized through the use of 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. 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 with the potential to cause runoff of sediment and pollutants.

Due to the minimal impacts to the on-site wetland and only runoff impacts expected to the on-site stream, the use of BMPs to prevent sedimentation, and the relatively low quality of the wetland and stream on site, impacts to on-site jurisdictional waters would be insignificant. These impacts would be the subject of the Section 404 and TDEC ARAP permits described in Section 1.4. Impacts to wetlands would be cumulatively mitigated if USACE determines mitigation is necessary.

Floodplains

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

minimum floodplain of concern is the 500-year floodplain. Critical actions are actions for which even a slight chance of flooding would be too great, such as an emergency facility. The Proposed Action is not considered a critical action.

Because it would be located outside the 100-year floodplain, the Proposed Action would be consistent with EO 11988 and would have no direct or indirect impacts 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 Proposed Action and No Action alternatives. The following components of biological resources are analyzed below: vegetation, wildlife, and rare, threatened, and endangered species.

The Mississippi Valley Loess Plains, also known as the Upper Gulf Coastal Plain, support a variety of agricultural uses and upland oak, hickory, and pine forests (Tennessee 2018; USGS 2018a). The natural vegetation type consists of upland forests dominated by hickory, oak, and loblolly-shortleaf pine (USGS 2018a). Average annual air temperature in the Mississippi Valley Loess Plains 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 of the proposed project site. Wildlife, vegetation, and threatened and endangered (T&E) species were researched during the desktop survey and verified through field investigations in May 2018, and updated species lists were obtained in July and August 2018. Results of desktop survey, field investigations, and list updates 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 undertaken by SR Innovation, LLC include:

- The Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544);
- The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712) (for actions of nonfederal entities);
- The Executive Order for Migratory Birds (EO 13186 of January 10, 2001) (for actions of federal agencies);
- The 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).

In addition to the above, in April 2018, TVA completed a programmatic consultation with the U.S. Fish and Wildlife Service on routine actions and federally listed bats in accordance with ESA Section 7(a)(2). Effects from mid-scale solar generation, such as the Project, are considered in the consultation. Over the course of 20 years, 1,000 acres are expected to be cleared of trees in

association with TVA's mid-scale solar program, and an estimated 50 acres will be cleared annually.

A USFWS Information for Planning and Conservation (IPaC) consultation was conducted to obtain the current county list and a preliminary list of known occurrences of federally listed T&E species in Shelby County, Tennessee. USFWS must be consulted during the planning stages of a project with a federal nexus and the potential to affect T&E species. Depending on the nature of potential impacts to listed species, consultation may be informal or formal. Formal consultation is required if the Proposed Action has the potential to adversely affect listed species or their critical habitat. Additionally, TVA provided lists from its Regional Natural Heritage Database (RNHD) of federal- and state-listed species in Shelby County and/or within a 10-mile radius of the project site or generally listed for Shelby County, Tennessee. 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 for the watershed and topographic quadrangle associated with the project site.

3.4.1 Affected Environment

The existing biological resources in the project site include vegetation and wildlife. Some rare, threatened, or endangered species have the potential to occur in the project area. Two TVA-designated natural areas are within 3 miles of the project site, the Windermere Farms and Apiaries and the Waterbury Conservation Easement of the Wolf River Conservancy; neither of these areas overlap with the project site.

3.4.1.1 Vegetation

The Loess Plains Level IV ecoregion is typically characterized by oak-hickory and loblolly-shortleaf pine forests (USGS 2018a). The forests 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*) (Griffith et al 1998). However, vegetation on the project site has been altered during human occupation and due to timbering and land clearing practices over time. Currently, approximately 38.6 acres of the 45-acre site is forested. Dominant woody species identified during the site visits on May 14 and 15, 2018 consist of red maple (*Acer rubrum*), American sycamore, tulip poplar (*Liriodendron tulipifera*), sweetgum, loblolly pine (*Pinus taeda*), and black oak (*Quercus velutina*) in the canopy layer. The understory is composed primarily of red maple, American beech (*Fagus grandifolia*), slippery elm (*Ulmus rubra*), winged elm (*Ulmus alata*), black cherry (*Prunus serotina*), red cedar (*Juniperus virginiana*), flowering dogwood (*Cornus florida*), mulberry (*Morus rubra*), pignut hickory (*Carya glabra*), and water oak (*Quercus nigra*). The understory was grubbed for forestry management under non-SRC ownership on approximately 21 acres of the site at some point prior to the May 2018 site visits (Figure 3-2). The tree stratum in the grubbed area is dominated by sweetgum and red maple, while American sycamore occupies approximately 10 percent (Photograph 3.5-1). Although disturbed, approximately 10 percent of the herb stratum is occupied by Nepalese browntop. Approximately 6.6 acres in the southern portion of the site was cleared in the early 2000s and is presently dominated by common field species such as ragweed (*Ambrosia artemisiifolia*), fescue species (*Festuca* sp.), annual bluegrass (*Poa annua*), red clover (*Trifolium pretense*), foxtail grass

(*Setaria* sp.), suckling clover (*Trifolium dubium*), Virginia plantain (*Plantago virginica*), lespedeza (*Lespedeza cuneata*), tall goldenrod (*Solidago altissima*), wild geranium (*Geranium maculatum*), buttercup (*Ranunculus arvensis*), and winged sumac (*Rhus copallinum*) (Photograph 3.5-2).

3.4.1.2 Wildlife

Habitat assessments for terrestrial animal species were conducted on the 45-acre project site on May 14 and 15, 2018. Landscape features in the project area consist of a variety of fragmented and contiguous forested habitat, wetlands, streams, early successional habitat (i.e. pasture and agricultural), and residential or otherwise disturbed areas. Of the approximate 45-acre project site, approximately 30.6 acres would be utilized for the solar facility. Each of the varying vegetative community types 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 surveys are indicated with an asterisk (*).

Deciduous forest represents approximately 85 percent of the 45-acre project site. Birds found in these types of habitats include chuck-will's-widow, downy woodpecker*, eastern screech-owl, red-tailed hawk, white-breasted nuthatch, northern mockingbird*, eastern towhee*, blue jay*, wood thrush, and yellow-billed cuckoo (National Geographic 2002). Such habitats also provide foraging and roosting habitat for several species of bats, particularly in areas where the forest understory is more open. Some examples of bat species likely found within this habitat are big and little brown, eastern red, evening, hoary, Rafinesque's big-eared, silver-haired, and tricolored bat. Coyote, eastern chipmunk, eastern gray squirrel*, raccoon*, white-tailed deer*, eastern woodrat, North American deermouse, and woodland vole are also mammals likely to be present within this habitat (Kays and Wilson 2002). Gray ratsnake, common gartersnake*, midland brownsnake, and scarlet kingsnake are all common reptiles of these habitats (Conant and Collins 1998). In forest sections with aquatic features, amphibians likely found in the area include dusky, marbled, mole, and spotted salamanders as well as barking and Cope's gray treefrogs (Conant and Collins 1998, Niemiller et al. 2011).

Early successional and herbaceous habitat represents approximately 15 percent of the project site, primarily consisting of an open field. Common inhabitants of fields and pastures in the region include 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 likely present in this habitat include 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 the project area are eastern milk snake, gray ratsnake, smooth earth snake and southern black racer, as well as eastern slender glass lizard (Conant and Collins 1998).

Scrub/shrub and forested wetland habitat also occurs within a small portion of the project site. Wetland habitat provides resources for such birds as prothonotary warbler, northern harrier, red-winged blackbird, song sparrow, swamp sparrow, and white-throated sparrow (National Geographic 2002). Mammals that may utilize this habitat are American beaver, eastern harvest mouse, marsh rice rat, muskrat, nutria, and swamp rabbit (Kays and Wilson 2002). Eastern black

kingsnake, eastern ribbonsnake, common gartersnake*, midland watersnake, and gray ratsnake are all wetland reptiles (Conant and Collins 1998). Eastern red-spotted newt and three-lined salamanders as well as American bullfrog*, bird-voiced treefrog, green frog, northern cricket frog, pickerel frog, and southern cricket frog are examples of some amphibians that may be present (Niemiller et al. 2011).

Review of the TVA RNHD indicated that no caves were documented within a 10-mile radius of the project site. No caves were identified during field investigations of the project site. No other 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 site or in its immediate vicinity.

Migratory Birds

The EO 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." The following prohibitions apply to migratory bird nests: "possession, sale, purchase, barter, transport, import and export, take, and collect" (USFWS 1918). The MBTA is executed and enforced by the USFWS. The construction contractor will be responsible for ensuring that its actions are consistent with the prohibitions under the MBTA.

The USFWS IPaC report identified two species of migratory birds (not including the bald eagle) listed on the USFWS 2008 Birds of Conservation Concern (BCC) that have the potential to occur in the vicinity of the project site (Table 3.4-1). BCC are those species not already federally listed that represent the highest conservation priorities of USFWS. The herbaceous, open-field habitat present on the southern portion of the project site may provide resources for the American kestrel (Cornell University 2017a). The prothonotary warbler occupies forested wetlands and bottomland forests, especially near water bodies. Its likelihood of occurrence increases with the size of the forested area (Cornell University 2017b). A small area of suitable habitat for this species occurs on the project site and more extensive suitable habitat occurs to the south along the Loosahatchie River.

Table 3.4-1. Migratory bird species on the BCC list potentially occurring in the vicinity of the project area.

Species	May Breed on Project Site	Habitat on Project Site
American Kestrel (*Falco sparverius paulus*)	Yes	Yes
Prothonotary Warbler *(Protonotaria citrea)*	Yes	Yes

***Source**:* USFWS 2018a; Field observations, May 2018.

3.4.1.3 Rare, Threatened, and Endangered Species

Rare, threatened and endangered species are regulated by both the federal and state governments (see Section 3.4). The USFWS IPaC report identified two federally listed species, with one listed as endangered and the other, as threatened wherever found (USFWS 2018b, 2018c). Within a 10-mile radius of the project site, TVA's RNHD included an additional three federally listed species, including one listed as endangered, one listed threatened, and one, a delisted taxon. The TVA RNHD also indicated four state-listed species with state statuses and ranks reported within a 10-mile radius (Table 3.4-2). Searching both the Loosahatchie River – Outlet watershed (HUC-12 digit 080102090406) and the Northeast Memphis USGS 7.5-minute series topographic quadrangle, the TDEC Natural Heritage Inventory Program identified seven species potentially associated with the project site. No databases indicated that designated critical habitats are present on the project site.

Table 3.4-2. Federal- and state-listed species potentially occurring in the project area

Scientific name	Common name	Federal status[a]	TDEC state status/rank[b]	TVA state status/rank[b]	Habitat present?
Amphibians					
Acris gryllus	Southern cricket frog	--	Rare, Not State Listed/S2S3	D/S3	Yes
Birds					
Ictinia mississippiensis	Mississippi kite	--	D/S2S3	--	No
Charadrius melodus	Piping plover	LT	--	--	No
Haliaeetus leucocephalus	Bald eagle	DM	--	D/S3	No
Sterna antillarum athalassos	Interior least tern	LE	--	E/S2S3_B	No
Limnothlypis swainsonii	Swainson's warbler	--	D/S3	--	No
Tyto alba	Barn owl	--	D/S3	--	Yes
Fishes					
Cycleptus elongatus	Blue Sucker	--	--	T/S2	No

Scientific name	Common name	Federal status[a]	TDEC state status/rank[b]	TVA state status/rank[b]	Habitat present?
Mammals					
Myotis septentrionalis	Northern long-eared bat	LT	Rare, Not State Listed/S1S2	--	Yes
Myotis sodalis	Indiana bat	LE	E/S1	--	Yes
Mollusks					
Triodopsis multilineata	Striped whitelip snail	--	--	TRKD/S2	Yes
Plants					
Rhynchospora harveyi	Harvey's beakrush	--	T/S1	--	Yes
Silene ovata	Ovate catchfly	--	E/S2	--	No
Symphyotrichum praealtum	Willow aster	--	E/S1	E/S1	Yes

Sources: TDEC 2018b; TVA 2018b; USFWS 2018b, 2018c

[a] ***Federal Status Abbreviations*** (TDEC 2018b; USFWS n.d.)
DM – Delisted taxon, recovered, being monitored first five years
LE – Listed endangered; Taxon is threatened by extinction throughout all or a significant portion of its range
LT – Listed threatened; Taxon is likely to become an endangered species in the foreseeable future

[b] ***State Status and Rank Abbreviations*** (TDEC 2018b; TVA-provided information, 8/10/2018)
_B – Breeds in Tennessee
D – Deemed in need of management
E – Endangered; Any species or subspecies whose prospects of survival or recruitment within the state are in jeopardy or are likely to become so within the foreseeable future
T – Threatened; Any species or subspecies that is likely to become an endangered species within the foreseeable future
TRKD – Tracked

S1 – Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extinction
S2 – Very rare and imperiled within the state, 6-20 occurrences, or few remaining individuals, or because of some factor(s) making it vulnerable to extinction
S3 – Rare and uncommon in the state, 21-100 occurrences
S#S# – Denotes a "range rank" because the rarity of the species is uncertain (e.g. S1S3)

Federally and State-Listed Species

A desktop analysis and assessment of available aerial and street-view photographs was conducted to identify the types of habitats present on the project site, including habitats that potentially could support listed species. In addition, a survey of biological resources on the project site was conducted on May 14 and 15, 2018. The survey focused on the general characteristics of the land cover, vegetation communities, and wildlife habitats currently present within and adjacent to the site and, in particular, to support a preliminary evaluation of the potential for special status species to occur on the site. This section evaluates those biological resources that potentially may constrain development of the proposed project.

Federally and state-listed species that have the potential to occur in the area are listed in Table 3.4-2. While all of these species have the potential to utilize the project site, the project site was found to have suitable habitat for one state-listed amphibian, one state-listed bird, one mollusk, two stated-listed plants, and two federally listed mammals, one of which is also state-listed. None of these species were incidentally observed during field investigations in May 2018.

The species found on Table 3.4-2 are considered below in regards to their preferred habitats and whether or not these are likely to be extant on the project site.

Amphibians

There is one state-listed amphibian species that may occur on the project site: the southern cricket frog. The streamside area of the on-site stream was recently grubbed for forestry practices prior to land purchase by SRC. With the exception of large trees, there is no understory or groundcover nearby the on-site stream or nearby the forested portion of the on-site wetland; therefore, potential habitat for the state-listed southern cricket frog exists only along the scrub/shrub portion of the wetland, as this amphibian prefers the grassy margins of water features that are not excessively shaded (NatureServe 2018). The eggs and larvae develop in shallow water, such as temporary pools.

Birds

One state-listed bird species that may occur on the project site: the barn owl. The project site provides a limited amount of suitable breeding habitat for the barn owl in hollow trees (NatureServe 2018). The scrub/shrub wetland and nearby open field on the project site are potential foraging habitat for this owl.

Two federally listed bird species, the piping plover and interior least tern, and two state-listed bird species, Swainson's warbler and the Mississippi kite, are listed in proximity to the project site. Piping plovers breed outside of the Project region, and nonbreeding habitat is usually on beaches, sand bars, and algal flats in protected bays (NatureServe 2018). Interior least terns utilize sparsely vegetated sandbars within medium to large rivers and nest on the shores of reservoirs and other lakes as well as along sand and gravel pits (NatureServe 2018). Swainson's warbler requires densely shaded, damp, deciduous floodplain or swamp forests (NatureServe 2018). Mississippi kites favor undisturbed stands of lowland and floodplain forests and along major rivers (TDEC 2018b; NatureServe 2018). No suitable habitat is present on the project site for any of these federally or state-listed bird species.

While included in lists provided by TVA, the bald eagle is listed as a delisted taxon due to recovery of the species. However, the bird is still protected under BGEPA and MBTA. Bald eagles typically nest in large mature trees capable of supporting their massive nests near large waterways where the eagles forage (NatureServe 2018). No large bodies of water that are likely to provide ample sources of food for bald eagles are present in the project area or immediately adjacent area. No eagles or eagle nests were observed during the field surveys, and the likelihood is low that the bald eagle would be found on the project site or within the immediate vicinity of the project area.

Fishes

Blue suckers use the largest rivers and the broadest portions of major tributaries, generally those with moderate current (NatureServe 2018). The fish species travels upstream to spawn in swift-moving riffles. The one perennial stream located on the project site is too small to support the single state-listed fish species (blue sucker) that may occur in the area; therefore, suitable habitat for this species does not exist within the project site.

Mammals

Two species of federally listed mammals potentially occur on the project site: the Indiana bat and the northern long-eared bat. Both of these bats prefer winter habitats (hibernacula) that include caves, mines, and cave-like structures (NatureServe 2018; USFWS 2015, 2018b, 2018c). Both species also utilize areas near caves in the fall and spring (for swarming and staging) prior to migration back to their summer habitat (roosting habitat) (NatureServe 2018). During the summer, Indiana bats roost under the exfoliating bark of dead and living trees in mature forests with an open understory often near sources of water. Indiana bats are known to change roost trees frequently throughout the season, yet still maintain site fidelity, returning to the same summer roosting areas in subsequent years. This species forages over forest canopies, along forest perimeters, tree lines, and occasionally over bodies of water (Kurta et al. 2002; Pruitt and TeWinkel 2007; USFWS 2018b).

In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees. While roost selection is similar to Indiana bat, northern long-eared bats are more opportunistic in roost site selection. This species has also been documented roosting in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014, 2018c).

Though records of both the Indiana bat and the northern long-eared bat are known from Shelby County, Tennessee, the exact locations are unknown (Tennessee Bat Working Group 2018a, 2018b). Field investigations on the project site determined that the forested areas provide potentially suitable summer roosting and foraging habitat for the two bats based on presence of snags and trees with exfoliating bark. Winter roosting habitats, such as caves, mines, or cave-like structures, do not exist on the project site. Water resources on the project site that could support foraging habitat for these bats include one stream and one wetland.

Bat surveys were conducted on May 22 to 24, 2018 by Jackson Group state- and federally permitted biologists (TN Permit No. 1645; USFWS Recovery Permit No. TE65346A-1) to inventory bat species that may be present on the project site. The surveys were conducted in accordance with USFWS guidance with the purpose of establishing the presence or probable absence of the two federally listed bat species that may occur on the project site: the Indiana bat and the northern long-eared bat (Jackson Group 2018; Appendix C). No bats were captured during the bat survey.

Mollusks

One state-listed mollusk species potentially occurs on the project site: the striped whitelip snail. Habitat for this terrestrial snail includes low wet habitats, marshes, floodplains, meadows, lake margins, under leaf litter or drift, and on the Mississippi River floodplain (NatureServe 2018). The scrub/shrub portion of the wetland on the project site provides potential habitat for this species.

Plants

The presence or absence of suitable habitat on the project site was evaluated for three state-listed plant species: Harvey's beakrush, the willow aster, and the ovate catchfly. Harvey's beakrush prefers barrens and other open areas, while the willow aster requires moist prairies and marshes, sometimes along roadsides (NatureServe 2018). The open fields on the southern portion of the project site may provide suitable habitat for both species; however, it maintains a xeric moisture regime and is regularly maintained by mowing. Portions of the project site along Point Church Road on the northern boundary may also provide potential habitat for the willow aster. Habitat present for both of these species is not ideal and no vegetative stems of these species were observed during the field survey; therefore, it is unlikely that either of these species are present on the site. The typical habitat of the ovate catchfly is rich forested areas. In Tennessee, the plant favors forested or open sandy or pebbly habitats such as floodplains. Such habitat is not extant on the project site, and no species of this genus (*Silene*) were observed during the field survey. Therefore; the ovate catchfly is absent on the site.

3.4.2 Environmental Consequences

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

3.4.2.1 No Action Alternative

Vegetation

Under the No Action Alternative, there would be no direct project-related impacts to the existing vegetation on the project site. It is assumed that the actively mowed field area on the project site would continue to be maintained. If these practices were discontinued, the site would likely become entirely forested in the far future and mature over the long-term.

Wildlife

Under the No Action Alternative, impacts to wildlife would be similar to those occurring to vegetation. If current practices continue, the field and forested areas would continue to support the wildlife currently present on the site. If these current practices were abandoned, over time, the wildlife type would shift toward that which prefers forested areas.

Rare, Threatened, and Endangered Species

Under the No Action Alternative, no direct project-related impacts to rare, threatened, and endangered species are anticipated. However, as with vegetation and wildlife, indirectly, over

time, shifts in habitat types caused by either the continuation or abandonment of land use practices on the project site could affect their suitability for listed species. For example, a shift towards a more forested vegetative cover would make it more habitable for forest-dwelling species, such as bats, but whether or not these species would be found on the site in the future is unknown.

3.4.2.2 Proposed Action Alternative

Vegetation

Under the Proposed Action Alternative, the proposed solar facility would result in direct impacts to vegetation. Tall vegetation and tree stumps would be removed from approximately 30.6 acres, including 26.3 acres of forested area and 4.3 acres of early successional open field. Following construction, the graded area within the fence, as well as areas excavated to install underground wiring and for other purposes, would be seeded with various grasses, and the solar facility would be maintained as described in Section 2.2.3 to prevent vegetation from growing taller than about 2 feet. This would result in the long-term conversion of most of the project site from forested areas to a mix of grass and herbaceous vegetation. No trees within a 50-foot perimeter surrounding the project site would be cleared.

Taking into consideration the large amount of similar habitats in the area regionally and locally, the clearing of the existing vegetation and light grading on the site would be considered a minor adverse impact. Approximately 15 percent of the project site is open field and undeveloped. Approximately 85 percent of the project site is forested and also undeveloped, and approximately 47 percent of the project site was recently grubbed at the understory and ground levels. The 30.6-acre area proposed for the solar facility site would require minimal vegetation removal from the field portion, while tree and, except in water resource buffers, stump removal would occur in the currently forested area. Because the surrounding area consists of very similar vegetative habitats, the effects of the conversion of 30.6 acres to maintained grass-herbaceous vegetation in this context would be relatively small. The construction and operation of the solar facility would not result in indirect impacts to vegetation on adjacent lands.

Wildlife

Direct impacts to wildlife are also anticipated under the Proposed Action. Much of the wildlife living on the project site, in areas that would be cleared of vegetation, grubbed, and graded and converted to solar arrays, would be displaced by construction activities. Localized adverse effects would occur to species inhabiting woodland, including a few species of migratory birds of conservation concern. Due to the acreage involved, regional impacts to these species would be insignificant. Following the completion of construction and site revegetation, some species adapted to grass and herbaceous fields such as field mice, eastern cottontail, common yellowthroat, and red-winged blackbird would likely reoccupy parts of the site. Minor shifts in species composition may occur due to the presence of the PV arrays, change in disturbance regime, and shift to periodically mowed grass and herbaceous fields. These impacts would be greatest on the approximate 26.3-acre forested area to be cleared and least on the approximate 4.3-acre open-field area to be cleared.

Overall, direct impacts to wildlife would be long-term and adverse but, given the relatively small acreage involved and prevalence of the affected habitat types in the project area, insignificant to regional populations.

Rare, Threatened and Endangered Species

Of the federally listed or state-listed amphibian, fish, or mollusk species described in Section 3.4.1.3., the project site only contains suitable habitat for the striped whitelip snail and the southern cricket frog in the shrub/scrub portion of the on-site wetland. The forested portion of the on-site wetland is not suitable habitat for either of these species due to the disturbance caused by grubbing of the understory and herbaceous strata by the current property owner and heavy shade cover. The site plan only proposes a minor impact to the forested portion of Wetland 1, in the form of a road crossing, and as such, suitable on-site habitat for the striped whitelip snail and southern cricket frog will not be affected and no impacts to these species are anticipated. Therefore, under the Proposed Action, no direct effects to any federally listed or state-listed mollusk, fish, or amphibian species are anticipated. With the implementation of BMPs to control on-site sedimentation during construction and the existence of the small gradient change over the project site, the likelihood of adverse downstream sedimentation impacts is low; therefore, under the Proposed Action, no indirect effects to any federally or state-listed mollusk, fish, or amphibian species are anticipated.

No federally listed bats were captured during the presence/absence bat survey for the Project. Therefore, the Proposed Action would not adversely affect the Indiana bat or the northern long-eared bat. As a voluntary conservation measure, the Project will make a reasonable effort to only remove trees between November 15 and March 31 when neither of these species would be roosting in trees on the landscape.

Under the Proposed Action, no direct or indirect effects to the ovate catchfly are anticipated due to lack of habitat and absence of the species on the project site. Under the Proposed Action, Harvey's beakrush and willow aster are likely not present on the site due to lack of ideal habitat and lack of observation of vegetative occurrence during the field survey; therefore, Harvey's beakrush and willow aster would likely not be affected by the Project. No direct or indirect effects are anticipated for these state-listed species.

Under the Proposed Action, no direct or indirect effects to Swainson's warbler, Mississippi kite, piping plover, interior least tern, or bald eagle are anticipated due to lack of habitat on the project site for these species. However, the project site does contain forested areas that may provide suitable breeding habitat for the barn owl in the form of hollow trees and suitable foraging habitat in the open field area; therefore, minor direct effects to this species may occur under the Proposed Action.

Overall, under the Proposed Action, no direct effects to federally listed threatened or endangered species are anticipated. A number of activities associated with the Project, including tree removal, were addressed in TVA's programmatic consultation with the U.S. Fish and Wildlife Service on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018. For those activities with potential to affect bats, TVA committed to implementing

specific conservation measures. Therefore, indirect impacts to federally listed bat species are expected to be minor. These activities and associated conservation measures are identified on pages 6-11 of the TVA Bat Strategy Project Screening From and would be reviewed and implemented as part of the Project. Potential direct effects to the barn owl may occur under the Proposed Action due to breeding and foraging habitat loss; however, no adverse effects to the area population are expected. No impacts to other rare, threatened, or endangered species are anticipated due to the Proposed Action.

3.5 VISUAL RESOURCES

This section describes an overview of the visual resources in the project area and the potential impacts on these visual resources that would be associated with the Proposed Action and No Action Alternative.

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 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 forested land, with open field in the southern portion of the site (Photographs 3.5-1 and 3.5-2). Generally, the project site is within an area dominated by residential developments to the west and in all directions as distance from the site increases. In the more immediate project area, industrial developments are extant to the south, and forested or cleared land exist to the north and east. The project site and surrounding terrain are characterized by moderately flat land with some gently rolling hills and several slight wetland and stream depressions amidst developed and undeveloped, forested areas. Scenic attractiveness of the project area is rated as typical or common of an urban and suburban area. Scenic integrity is assessed as moderate due to the relative inconsistency of the industrial and forested areas with the more typical residential developments of the general vicinity.

Photograph 3.5-1. View of the forested portion of the project site.

Photograph 3.5-2. View of the open-field portion of the project site.

Prominent visual resources surrounding the project site include the Canadian National Railroad and the Hawkins Mill residential development to the west; Point Church Road and an undeveloped, forested area to the north; an electrical transmission line corridor and cleared land to the east; and the Nike NALC-Memphis campus to the south (Photographs 3.5-3 and 3.5-4). The Links at Davy Crockett, a City of Memphis-owned golf course, is located northwest of the project site, and Willingham Park, a City of Memphis-owned park and community center, is located to the southeast. However, views from these recreation areas to the project site are completely obscured by mature trees.

A 1.3-mile segment of the Canadian National Railroad borders the project site on the west. The railroad is built on a raised embankment covered with rock ballast that supports double tracks on wooden cross ties (Karpynec et al. 2018). The railroad is situated within a tree-lined corridor that largely buffers the surrounding modern residential and industrial development.

Point Church Road is a two-lane roadway that travels between Gruber Drive and Hawkins Mill Road for a total estimated length of 0.8 mile. The western half of Point Church Road is surrounded by Hawkins Mill, a residential subdivision primarily developed between the early 1970s and 1990. In Hawkins Mill, moderately sized, ranch-style homes line streets and cul-de-sacs framed by mature trees. The eastern half traverses undeveloped forested areas situated north of the project site and within the project site's northern portion. This section of Point Church Road has an undeveloped, natural quality consistent with the majority of the project site.

Nike NALC-Memphis, located south of the project site, is a 2.8 million-square foot industrial facility completed in 2015 (Nike 2015). NALC-Memphis distributes Nike products to retail outlets and wholesale customers. The immediate foreground of the facility is currently cleared and/or developed land, while distant trees frame the facility's viewshed in all directions. An MLGW-owned electrical transmission line corridor separates forested areas immediately east of the project site and recently cleared areas farther to the east.

Photograph 3.5-3. View of the Nike NALC-Memphis campus south of the project site.

Photograph 3.5-4. View of Canadian National Railroad west of the project site.

3.5.2 Environmental Consequences

This section describes the potential impacts to visual resources should the No Action or the Proposed Action alternatives be implemented. For this analysis, the construction and operation phases are treated separately as construction would be temporary and have different visual impacts than 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 direct project-related impacts to visual resources would result. Existing views of the site would be expected to remain relatively unchanged from the present mix of residential, industrial, and undeveloped land. Indirect impacts to visual resources are possible as the City of Memphis grows. Additionally, visual changes may occur over time as vegetation on the properties changes. For example, if the open-field portion were no longer mowed, vegetation would change from low profile plants to bushes and trees.

3.5.2.2 Proposed Action Alternative

Visual concerns are often associated with both large- and small-scale solar facilities, including the electrical infrastructure that may be added for the facility. The Project would convert an open-field area and forested land to a commercial and industrial land use type. Figure 2-2 shows the site layout including the solar panels, perimeter fencing, access road and security gate, and existing overhead powerlines.

During the May 2018 site visits, the HDR field team assessed the potential for visual impacts from the Proposed Action on the project site. The project site consists of relatively flat to gently sloping terrain. The majority of the project site would remain visible from cleared areas to the south and southeast of the site. The relatively stable elevations and maintenance of an approximate 50-foot buffer of trees along the Canadian National Railroad to the west, Point Church Road to the north, and to the east of the project site would largely shield views from other vantage points, including the Hawkins Mill residential subdivision to the west of the railroad.

From the north side of the NALC-Memphis facility and portions of New Allen Road, onlookers may notice a striking difference when the Project is completed, as no trees are currently present on the southern perimeter of the project site. However, the oblique angle at which travelers on New Allen Road would view the solar facility and the matte, anti-reflective, PV panel surfaces would minimize or eliminate negative impacts such as glare and reflection, and occupants of the approximate 6,347 daily vehicles on the road (TDOT 2018a) would likely view the solar facility for less than one minute when traveling north. Travelers would be unlikely to view the facility when traveling south on New Allen Road.

The construction of the proposed solar facility would temporarily alter the visual character of the project area. During construction, heavy machinery would be present, changing the visual aspects of the project area from the north viewshed of NALC-Memphis and the northwest viewshed of New Allen Road. The project site would appear as a mixture of browns and grays due to earthmoving, road construction, and concrete activities. Water would be used to keep soil from aerosolizing, so dust clouds are not anticipated. Visual impacts from construction would be minimized at night, as no lighting would be needed during construction. Erosion control silt fence and sediment traps would be removed once construction is complete, and bare areas from removal would be vegetated.

From NALC-Memphis and nearby portions of New Allen Road, the manufactured, structure appearance of the completed solar facility would be most apparent and likely more visually intrusive in the morning, when the panels would be upright (approximately 6 feet from the ground at full tilt). However, this effect would be minimized at mid-day, when the panels would be relatively flat (approximately 3-feet-tall when lying flat). In the evening, when the panels would be upright facing west, the visual effects would be reduced by the substantial tree buffer in that direction. Moreover, the introduction of solar panels in an area with diverse land uses, including commercial, industrial, residential, and undeveloped, would minimize the visual effects of the solar facility. Taking all of this into account, implementation of the Proposed Action is expected to result in minor adverse impacts to visual resources.

Indirect impacts to visual resources around the project site may occur due to increased traffic and movement of heavy machinery throughout the site and along local roads. Overall, there would be minor direct and indirect impacts to visual resources during the construction phase of the Proposed Action. However, these impacts would be temporary (less than 1 year), and there are few onlookers in the vicinity that would be affected by the appearance of the activities.

Overall, the visual alteration from undeveloped, open-field and forested land to a large solar facility in an area with diverse land uses is not expected to result in significant adverse impacts. Visual impacts during the operation phase of the Project would be moderate in the immediate vicinity, but minimal on a larger scale, due to variation of the visual attributes of the project area. These impacts would be minimized, however, due to the 50-foot tree buffer around parts of the periphery of the site and adjacent to nearby roadways.

Photograph 3.5-5. Single-axis, tracking photovoltaic system with panels close to maximum tilt as viewed from the east or west.

Photograph 3.5-6. The back of the 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 Proposed Action and No Action Alternative.

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 3.6-1.

Table 3.6-1. 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 10 dBA lower than those during the day (USEPA 1974).

A 1/2-mile radius around the project site was examined to characterize existing land uses and identify potential noise sensitive receptors. Noise sensitive receptors can best be defined as those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur. The project site is located within a residential and industrial area of Memphis, Shelby County, Tennessee. Approximately 608 sensitive noise receptors are located within 1/2 mile of the project site, with the closest single family residence being located along Ajanders Cove in the Hawkins Mill subdivision approximately 260 feet west of the western project boundary and approximately 320 feet from the proposed solar panels. Several other residences within the Hawkins Mill subdivision are between 270 and 300 feet of the project site boundary; these generally line Conti Cove, Letrec Cove, Ajanders Cove, and Elbert Cove and the eastern sides of Point Church Road, Ajanders Drive, and Elbert Drive (Figure 3-).

Surrounding land uses include residential, forestry management, commercial/industrial, and the Canadian National Railroad. Ambient noise at the project site consists mainly of railroad, industrial activities associated with the Nike NALC-Memphis facility, moderate traffic, and natural sounds (moderate voice, wind, wildlife, and similar sounds). Generally, noise levels in these types of

areas range from 45 to 55 dBA; although the proximity to the railroad raises the range from 85 to 95 dBA (USDOT 2015).

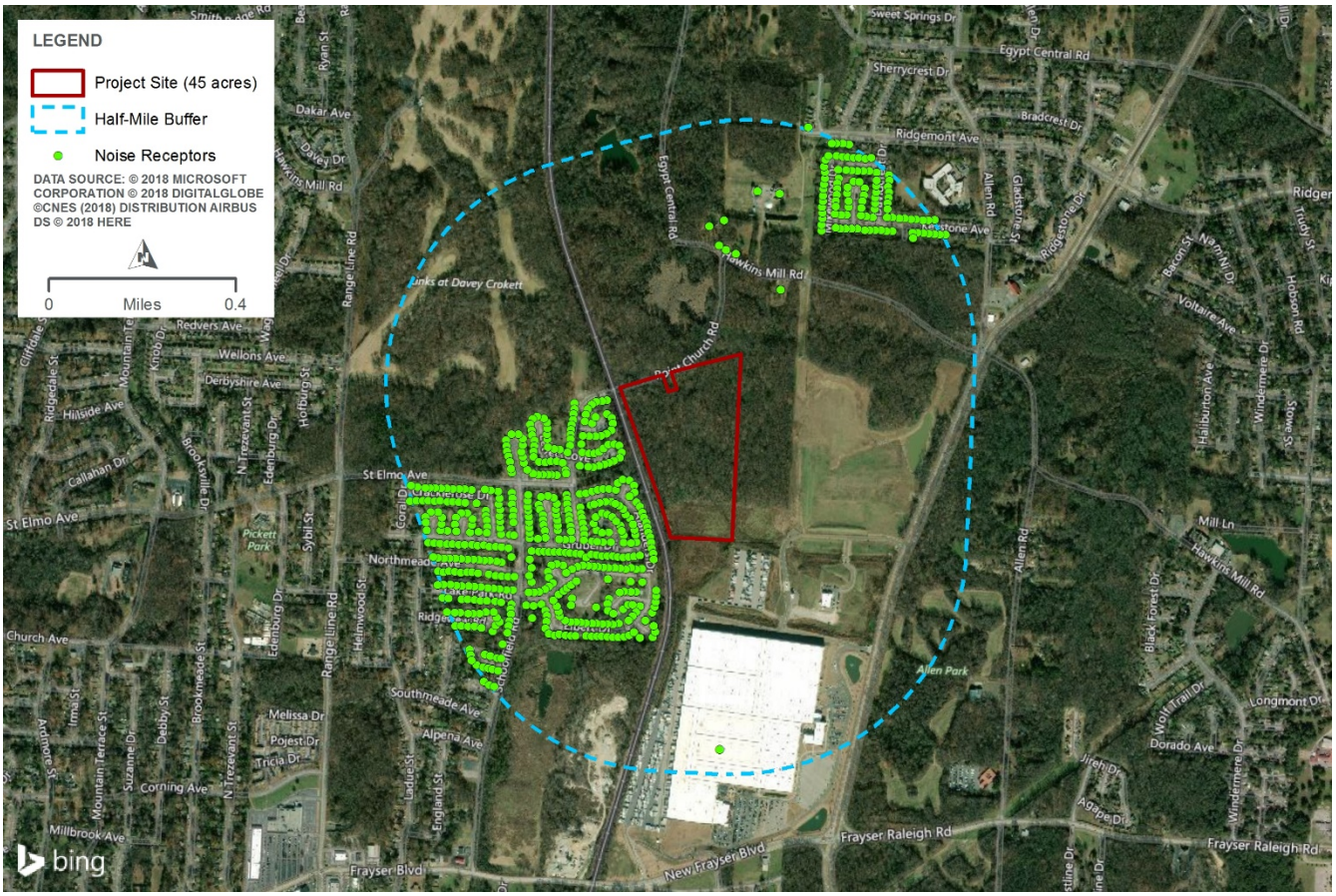


Figure 3-8. Sensitive noise receptors in the vicinity of the project site.

3.6.2 Environmental Consequences

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

3.6.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed and no project-related impacts on the ambient sound environment would occur. Existing land use would be expected to remain undeveloped 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. The noisiest 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 4 months (120 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 sensitive receptors, occupied residences along Conti Cove, Letrec Cove, Ajanders Cove, and Elbert Cove and the eastern sides of Point Church Road, Ajanders Drive, and Elbert Drive in the Hawkins Mill subdivision, are near the western boundary of the project site, the closest within approximately 320 feet of the proposed solar arrays. The adjacent residences would temporarily experience heightened noise during construction, primarily from the pile driving activities. Construction would only occur during daylight hours, so the Project would not affect ambient noise levels at night. 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 would be pile driving during the construction of the array foundations, which would be completed in approximately 1 month. Standard construction pile drivers are estimated to produce between 90 to 95 dBA (calculated at a distance of 50 feet) at close range (USDOT 2015). The specialty pile drivers proposed to be used for solar panel installation produce less noise, and the piles supporting solar panels would be driven into soil with little to no rock drilling anticipated. Construction workers would wear appropriate hearing protection in accordance with Occupational Safety and Health Act (OSHA) regulations. As construction would occur during the day, when NALC-Memphis activities and more traffic would occur, there would not be a substantial difference in noise levels other than during pile driving.

Following completion of construction activities, the ambient sound environment would be expected to return to existing levels. The moving parts would be electric-powered and would produce little noise. Consequently, the Proposed Action would have minimal effects on noise levels as a result of normal continuous operation. The periodic mowing of the site to manage the height of vegetation would produce sound levels comparable to roadway traffic in the surrounding area although at less frequent intervals.

Overall, implementation of the Proposed Action would result in minor, temporary adverse impacts to the ambient noise environment for those residents living near the project area during construction. Noise impacts during operation and maintenance of the solar farm would be negligible.

3.7 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

This section describes an overview of 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 Proposed Action and No Action Alternative.

3.7.1 Affected Environment

Ambient air quality is determined by the type and amount (concentration) of pollutants emitted into the atmosphere, the size and topography of the air basin in question, and the prevailing meteorological conditions in that air basin. Through its passage of the Clean Air Act of 1970 (CAA)

and its amendments, Congress has mandated the protection and enhancement of our nation's air quality. The USEPA has established the National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants to protect the public health and welfare: sulfur dioxide (SO_2), ozone (O_3), nitrogen dioxide (NO_2), particulate matter whose particles are less than or equal to 10 micrometers (PM_{10}), particulate matter whose particles are less than or equal to 2.5 micrometers ($PM_{2.5}$), carbon monoxide (CO), and lead (Pb).

The primary NAAQS were promulgated to protect public health, and the secondary NAAQS were promulgated to protect public welfare (e.g., visibility, crops, forests, soils and materials) from any known or anticipated adverse effects of air pollutants. 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. 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 (USEPA 2018c). Finally, areas that were formerly nonattainment for a pollutant and 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 a 20-year maintenance period, the status reverts back to normal attainment.

3.7.1.1 Regional Air Quality and Pollutant Emissions

A part of Shelby County, Tennessee is under a State Implementation Plan (SIP) for lead due to prior nonattainment status that ended in July 2001 (USEPA 2018d). Also, the whole Memphis metro area, including counties in Tennessee, Arkansas, and Mississippi, is a maintenance area for ozone, having come into compliance with this NAAQS in July 2016. Despite some past air quality issues, the whole Memphis metropolitan area is currently meeting all NAAQS. The National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of both Criteria and Hazardous air pollutants from all air emissions sources. The NEI is prepared every 3 years by the USEPA based on emission estimates and emission model inputs provided by state, local, and tribal air agencies for sources in their jurisdictions, and supplemented by data developed by USEPA. The emissions in Shelby County for 2014 are presented in Table 3.7-1. These emissions are from the fuel combustion, industrial, fuel combustion other, petroleum and related industries, other industrial processes, waste disposal and recycling, highway vehicles, off highway, solvent utilization, storage and transport, and miscellaneous sectors (USEPA 2014).

Table 3.7-1. Emission of NAAQS pollutants in Shelby County for 2014.

Pollutant	Emissions (tons per year)
Carbon Monoxide	125,166.0
Nitrogen Oxides	32,043.1
PM_{10} Primary	11,753.3
$PM_{2.5}$ Primary	4,306.3
Sulfur Dioxide	14,194.7
Volatile Organic Compounds	24,971.5

Source: USEPA 2014.

3.7.1.2 Greenhouse Gas Emissions

GHGs are compounds found naturally within the earth's atmosphere, and emitted by human activities, that trap infrared radiation near the earth's surface. In this way, GHGs act as insulation in the atmosphere and contribute to the maintenance of global temperatures at higher levels than would occur without GHGs. The most common GHGs emitted from natural processes and human activities include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). However, water vapor emissions tend to "rain out" of the atmosphere and are not considered an additive effect on anthropogenic global warming. Because a given mass of CH_4 or N_2O are estimated to be many times more effective at infrared absorption compared to the same mass of CO_2, the emissions of these compounds are often presented in terms of CO_2 equivalents (CO_2e).

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, measured CO_2e (USEPA 2018e). The largest source of CO_2 and of overall GHG emissions is fossil fuel combustion. CH_4 emissions, US emissions of which have declined from 1990 levels, result primarily from enteric fermentation (digestion) associated with domestic livestock, decomposition of wastes in landfills, coal mining, and natural gas from petroleum drilling and production activities. Agricultural soil management, wetlands, and mobile source fuel combustion are the major sources of N_2O emissions in the US (USEPA 2018f). Shelby County GHG emissions estimated for 2016 from human activities are shown in Table 3.7-2. GHG emissions from the TVA power system are described in TVA's Integrated Resource Plan Final Supplemental Environmental Impact Statement (2015). TVA emissions of GHGs in Shelby County have recently decreased with the retirement of the coal-fired units at its Allen plant and their replacement with lower emitting natural gas-fueled combined cycle generating units.

Table 3.7-2. Emissions of GHGs in Shelby County for 2016.

Pollutant	Emissions (tons per year)
Carbon Dioxide	5,465,582
Methane	172,172
Nitrous Oxide	23,266

Source: USEPA 2017.

3.7.2 Environmental Consequences

This section describes the potential impacts to climate and air quality should the Proposed Action be implemented.

3.7.2.1 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 climate or air quality would result. Existing land use would be expected to remain a mix of residential, industrial, and undeveloped land, and the existing habitat would be expected to remain as it is at present, with little effect on climate and air quality.

3.7.2.2 Proposed Action Alternative

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 employee's personal vehicles, and fugitive dust mobilization from clearing, grading and other activities. Combustion of gasoline and diesel fuels by internal combustion engines (haul trucks and offroad- vehicles) would generate local emissions of PM, nitrogen oxides (NO_x), CO, volatile organic compounds (VOCs), and SO_2.

If open burning of debris from tree clearing on the site may occur, the appropriate open burning permit would be obtained, and 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. No burning of other construction debris is anticipated. 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 the construction and contractors' vehicles would travel to reach the site. As necessary, fugitive dust emissions from construction areas, 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 (USEPA 1998). Therefore, it is anticipated that air quality impacts associated with construction of the solar energy system would be minimal and limited in duration.

No noticeable direct or indirect impacts to regional climate would be associated with the construction of the proposed Project. The use of construction equipment would cause a minor temporary increase in GHG emissions during the construction activities, as would production of

the materials used in construction. The total amount of these emissions would be small and would result in negligible impacts.

The operation of the proposed solar facility is not anticipated to have adverse impacts to air quality or GHG emissions. No emissions would be produced by the operation of the solar facility. 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 marginally decrease during operations as the low-emissions 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 global scales. It would, however, be a component of the larger planned system-wide reduction in GHG emissions by the TVA power system. The potential adverse impacts of GHG emissions and the beneficial impacts of TVA's reduction in GHG emissions are described in more detail in TVA's Integrated Resource Plan Final Supplemental Environmental Impact Statement (2015).

3.8 CULTURAL RESOURCES

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

3.8.1 Affected Environment

3.8.1.1 Regulatory Background

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, 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 National Register of Historic Places (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 generally 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 actions 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 under the direct or indirect jurisdiction of a federal agency that has the potential to affect a historic property.

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).

Throughout the process, the lead federal agency must consult with the appropriate SHPO, federally recognized American Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking. 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. Considerations of these cultural resources as well as those of NRHP-eligible traditional cultural resources (also called traditional cultural properties; see Parker and King 1998)

are often accomplished through consultation with parties having a vested interest in the undertaking, as described above.

3.8.1.2 Cultural Resources Identification Methods

As part of the evaluation process, a Phase I cultural resources survey was conducted on the project site and vicinity in May 2018 to determine the presence of archaeological and architectural cultural resources that are listed or eligible for listing in the NRHP (Karpynec et al. 2018). The project area for archaeological resources, also referred to as the archaeological area of potential effects (APE), consists of the approximate 45-acre project site that would be affected by the Proposed Action. The project area for historic architectural resources, also known as the historic architectural APE, includes the project site and portions of a 1/2-mile radius surrounding the project site that are visually connected to the project site by direct line-of-sight.

Following guidelines established by TDEC and the Tennessee Historical Commission (TDEC 2009; THC 1991), the archaeological field survey consisted of systematic surface and subsurface investigation of the archaeological APE. The architectural field survey consisted of identifying architectural resources appearing to be 50 years of age or older and noting characteristics of design, construction, and other aspects of its architectural integrity needed to preliminarily evaluate the property's eligibility for listing in the NRHP.

3.8.1.1 Background Research

Background research focused on the project site and a surrounding 1/2-mile radius (hereafter, the research radius) was conducted to identify previously recorded cultural resources, to characterize the cultural and historical context, and to develop effective methods to identify cultural resources in the archaeological and historic architectural APEs. Background research showed that one archaeological resource, no historic architectural resources, and two cultural resources surveys were previously recorded or conducted in the research radius. Reviews of regional and national cartographic and ethnohistoric databases identified several historical maps or aerials that were utilized to gain a detailed understanding of past human activities in the research radius.

One previously recorded archaeological resource (40SY707) was identified in the research radius. Site 40SY707 was documented in 2007 as a Woodland period, Pre-Contact site (Saatkamp 2007). Researchers concluded that the site is not eligible for the NRHP due to disturbances and erosion. The site was recorded during one of the two cultural resources surveys previously conducted in the research radius. The other survey identified no cultural resources (Stallings 2016), and neither of the surveys overlap with the current project site. Cartographic research identified one unnamed cemetery in the research radius, outside of the project site. Historical maps documented that two buildings formerly on the project site were likely built between 1916 and 1955 and razed between 1955 and 1973. An extensive cultural context for the project area is available in the cultural resources report in Appendix D.

3.8.1.2 Survey Results

No archaeological resources were identified during the archaeological field survey, in which a total of 259 30-x-30-centimeter square units were investigated to a depth of 70 centimeters below surface or where the water table was encountered. Cultural materials were recovered from four shovel tests, all of which were in proximity to one of the two buildings formerly on the project site. Upon analysis, the recovered materials were determined to be modern and not associated with historical use of the building and were discarded. Pertinent survey records are curated in association with the Project at the Erskine Ramsay Archaeological Repository at Moundville Archaeological Park in Alabama.

One architectural resource (IS-1) was newly identified in the historic architectural APE. IS-1 is a 1.3-mile segment of the Canadian National Railroad that borders the project site on the west. The railroad was constructed as the Illinois Central Railroad in the early twentieth century, when it was built to connect the Louisville and Nashville Railroad with the Chesapeake, Ohio and Southwestern Railroad. In 1998, Canadian National purchased the railroad. The segment bordering the project site features a raised embankment covered with ballast that supports a modern double track composed of wooden cross ties and steel rails. Researchers concluded that IS-1 is not eligible for the NRHP due to ongoing maintenance negatively affecting its historic architectural integrity.

3.8.2 Environmental Consequences

No cultural resources listed or eligible for listing in the NRHP were identified during background research or during field surveys of the archaeological or historic architectural APEs. Given the extensive survey completed within the archaeological and historic architectural APEs, the potential for additional, unidentified cultural resources in the Project APEs is considered very low. Any undiscovered archaeological resources that may exist in the archaeological APE would likely be highly-disturbed, low density artifact scatters ineligible for listing in the NRHP.

TVA concurs with the recommendation in the cultural resources survey report that no historic properties would be affected by the construction and operation of the proposed solar facility. TVA consulted with the Tennessee SHPO on this determination (Appendix E). In a letter dated September 12, 2018, the TN SHPO concurred with TVA's no effect findings. Additionally, TVA consulted with federally recognized Indian tribes on the proposed undertaking. In a letter dated October 16, 2018, the Chickasaw Nation concurred with TVA's findings. TVA received no objections from federally recognized Indian tribes on the project.

3.9 SOLID AND HAZARDOUS WASTE

This section describes an overview of existing solid and hazardous waste within the project area and the potential impacts associated with solid and hazardous waste that would be associated with the No Action and Proposed Action Alternatives.

3.9.1 Affected Environment

The project site has consisted of undeveloped and/or agricultural land since at least 1937. An ASTM standard E1527-13 Phase I Environmental Site Assessment (ESA) was performed on May 10, 2018 (Quarry and Spores 2018). The Phase I ESA was conducted following recent grubbing of portions of the forest understory; land use at the time was predominately undeveloped and wooded with a cleared area in the southern portion. Two sewer line manholes were present in the southern portion of the wooded area. The Phase I ESA did not identify the presence, former use or spillage of hazardous substances, petroleum products or other recognized environmental conditions.

Collection and disposal of all solid waste within the City of Memphis, including the project site, is conducted by Solid Waste Management in the Public Works Division of the City (City of Memphis 2018b). Nonhazardous wastes, including construction wastes, are hauled to an operating Class I facility. Various vendors offer hazardous waste removal.

3.9.2 Environmental Consequences

3.9.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no direct or indirect project-related impacts associated with solid and hazardous waste would occur. Existing land use would be expected to remain a mix of residential, industrial, and undeveloped land, and existing waste management conditions would be expected to remain as they are at present.

3.9.2.2 Proposed Action Alternative

Minimal waste, consisting mainly of trees and other tall vegetation, would be generated during site preparation. The materials used for construction of the project would include PV panels, metal racking and mounting systems, electrical connectors, cable, wire and general building materials such as crushed stone, concrete and asphalt. These materials would be delivered to the site and installed in the manner specified in project drawings and as described in Section 2.2. Packaging waste and other waste generated during construction would be collected and segregated by type in on-site receptacles prior to removal from the site. Wastes would be recycled to the extent feasible, and any remaining wastes would be trucked to one or more operating Class I landfill facilities for disposal. The selected landfill would have ample capacity for disposing of waste generated during construction of the solar facility and transmission interconnection.

Hazardous wastes are expected to be used for equipment purposes only. Vendors and suppliers will be responsible for removal of drums, barrels, and material containing hazardous waste in accordance with applicable state and federal regulations. If the total volume of on-site oil (used in the one proposed transformer) exceeds 1,320 gallons, a Spill Prevention, Control, and Countermeasure (SPCC) plan would be completed. TVA would implement procedures to minimize fuel spills during construction and operation of the facility. Waste generated during operation would be minimal and would mainly result from replacement of equipment. Upon expiration of the 20-year PPA or an amended or alternative PPA for the sale of power after the

20-year period, SR Innovation, LLC would develop a decommissioning plan to document the recycling and/or disposal of solar facility components in accordance with applicable regulations. Impacts from the generation of solid and hazardous waste during the construction and operation of the proposed facility would be insignificant.

3.10 TRANSPORTATION

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

3.10.1 Affected Environment

3.10.1.1 Roads

The northern boundary of the project site abuts Point Church Road from the road's intersection with the Canadian National Railroad and eastward toward the road's connection with Hawkins Mill Road. Both Point Church and Hawkins Mill roads are two-lane paved roads designated as Urban Collectors in the Roadway Functional Classification System for Shelby County (Shelby County 2013).

The northwest corner of the project site, near the proposed Project entrance, is approximately 1 mile west of the intersection of Hawkins Mill Road and New Allen Road. New Allen Road is a four-lane paved road with a median designated by the county as an Urban Minor Arterial. New Allen Road extends north-south between Raleigh-Millington Road and Scenic Highway. Raleigh-Millington Road is also an Urban Minor Arterial, while Scenic Highway is designated an Urban Collector.

From the proposed Project entrance, US 51 (Thomas Street) is approximately 3.1 miles west. In Tennessee, US 51 extends north-south between the Mississippi-Tennessee and the Kentucky-Tennessee state lines. From the Project entrance, the shortest route to Interstate 40 (I-40) is approximately 3.8 miles to the south. This route is via Range Line Road, which extends north-south approximately 0.7 mile to the west. From Range Line Road, I-40 is approximately 3.1 miles south. I-40 can also be accessed from the project site via Point Church to Hawkins Mill to New Allen roads. By this route, I-40 is approximately 4.5 miles south of the Project.

No public roads are present within the project site. Dirt roads on the project site or immediately adjacent provide vehicular access to the open-field area in the southern portion of the project site and the forested areas in the central and northern portions.

3.10.1.2 Traffic

The proposed Project entrance will be via a newly constructed road accessed from Point Church Road near the northeast corner of the project site boundary. Existing traffic volumes were determined using Annual Average Daily Traffic (AADT) counts measured at existing Tennessee Department of Transportation (TDOT) stations (TDOT 2018a). Immediately west of the proposed Project entrance on Point Church Road, the 2016 AADT was 3,085 vehicles at Station 583.

Approximately 1 mile southwest of the proposed Project entrance, the 2016 AADT was 10,163 vehicles at Station 411 along Range Line Road. Approximately 1.5 mile southeast of the proposed Project entrance, the 2016 AADT was 13,232 vehicles at Station 65 along Frayser-Raleigh Road. Approximately 1.45 mile to the east of the proposed Project entrance, the 2016 AADT was 1,504 vehicles at Station 721 along Hobson Road. Approximately 0.83 mile northeast of the proposed Project entrance, the 2016 AADT was 3,213 vehicles at Station 723 along Old Allen Road. The minor urban roads around the project site experience lower levels of traffic than the AADT average for Shelby County.

The Canadian National Railroad passes north-south along the western boundary of the project site. At Point Church Road, the railroad crosses via an underpass. The closest major airport is the Memphis International Airport, approximately 14.6 miles south of the project site. The closest regional airport is the Charles W. Baker Airport operated by the Memphis-Shelby County Airport Authority, which is a public-use airport with an asphalt runway located approximately 4.4 miles northeast of the project site.

3.10.2 Environmental Consequences

This section describes the potential impacts to transportation resources should the Proposed Action be implemented.

3.10.2.1 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 transportation resources would result. Existing land use would be expected to remain a mix of residential, industrial, and unused land, and the existing transportation network and traffic conditions would be expected to remain as they are at present.

3.10.2.2 Proposed Action Alternative

The construction and operation of the proposed solar facility would have no effect on operation of the airports in the region. Memphis International Airport, the closest major airport, is located approximately 14.6 miles south of the project area. Charles W. Baker Airport, the closest regional airport, is located approximately 4.4 miles northeast of the project site. There are several forested areas between Charles W. Baker Airport and the proposed solar facility. Also, there is a fringe of trees along the eastern boundary of the proposed solar facility that will remain in place. The distance between the major and regional airports and the proposed solar facility, coupled with the areas of trees between the airport(s) and the proposed solar facility, serve to minimize any effects the proposed solar facility may have on air traffic. The operation of the solar facility would not affect commercial air passenger or freight traffic in the region and would not adversely affect any crop dusters operating in the vicinity of the project area.

During construction of the proposed solar facility, a crew of approximately 40 to 60 workers would be present at the project site from approximately 7 am to 3:30 pm, 6 days a week (Monday through Saturday), for approximately 4 months (120 days). A majority of these workers would likely come from the local or regional area (within a 50-mile radius). Approximately 20 percent of the workforce would be supervisory personnel, likely from out-of-state, and many would likely stay in local hotels

in the Memphis area. Workers would likely drive their own vehicles or carpool to the project site. Parking would be on site during the day. Some workers would likely visit local restaurants and businesses during working hours. Additional traffic due to deliveries and waste removal would consist of a maximum of approximately 10 vehicles per day during construction.

Traffic flow around the work 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 access the project site from the north on Point Church Road. No major industries, other commercial facilities, or residences are located along Point Church Road in the vicinity of the project site. The project site is positioned at the approximate boundary of elementary school zones, and Point Church Road may serve as routes to either Hawkins Mill Elementary School at 1378 Ethlyn Avenue or Keystone Elementary School at 4301 Old Allen Road. While both schools are over 1 mile from the project site, should traffic flow be a problem, SR Innovation, LLC would consider staggered work shifts to space out the flow of traffic to and from the project site and would also consider posting a flag person during the heavy commute periods to manage traffic flow and to prioritize access for local residents. Use of such mitigation measures would minimize potential adverse impacts to traffic and transportation to less than significant levels.

Construction equipment and material delivery would require up to approximately 10 semi-trailer trucks or other large vehicles visiting each project site per day during the approximate 4-month construction period. The project site can both be accessed via routes which do not have load restrictions. These vehicles should be easily accommodated by existing roadways; therefore, only minor impacts to transportation resources in the local area would be anticipated as a result of construction vehicle activity.

Several on-site maintenance access roads would be maintained on the project site. Following construction, the gravel roads would be maintained to allow periodic access for site inspection and maintenance. They would be closed to through traffic.

Possible minor traffic impacts along Point Church Road could occur as workers commute to the project site. However, the proposed workforce would consist of a maximum of approximately 60 employees for an approximate 4-month period; therefore, the addition of these vehicles to the existing traffic on Point Church Road would be considered minor.

The solar facility would not be staffed during operation; however, maintenance would be required quarterly and for equipment failures and would require minimal personnel. Therefore, the operation of the solar facility 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 and mitigated. The Proposed Action would not result in any indirect impacts to transportation.

3.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section describes an overview of existing socioeconomic conditions and environmental justice considerations within the project area and the potential impacts that would be associated with the Proposed Action and No Action Alternative. Components of socioeconomic resources

that are analyzed include population and employment, while components of environmental justice that are analyzed include minority and low-income populations.

3.11.1 Affected Environment

The project site is located in the northwestern portion of Shelby County, approximately 10 miles northeast of downtown Memphis, Tennessee. The project site falls entirely within the 2010 Census Tract (CT) 205.21, which is defined as the project area for socioeconomic resources and environmental justice considerations (Figure 3-). Table 3.11-1 lists relevant USCB data for the project area as compared with that of Shelby County and Tennessee.

The 2010 decennial census calculated the total population for the project area as 3,693. The total population of Shelby County was 927,644 and the state, 6,346,105, in 2010 (USCB 2010). Based on 2012 to 2016 American Community Survey (ACS) 5-year estimates, minorities composed 92.6 percent of the total population of the project area, while minorities made up 60.4 percent of the county population and 22.2 percent of the state population (USCB 2016a). The proportion of the population estimated as below the poverty level for CT 205.21 in 2016 was 45.7 percent. For the county and state, the estimates were 21.4 percent and 17.2 percent, respectively (USCB 2016b). Estimated per capita incomes for CT 205.21, county, and state based on 2016 inflation-adjusted dollars were $10,501, $26,963, and $26,019, respectively (USCB 2016b). Additional census data are presented in Table 3.11-1.

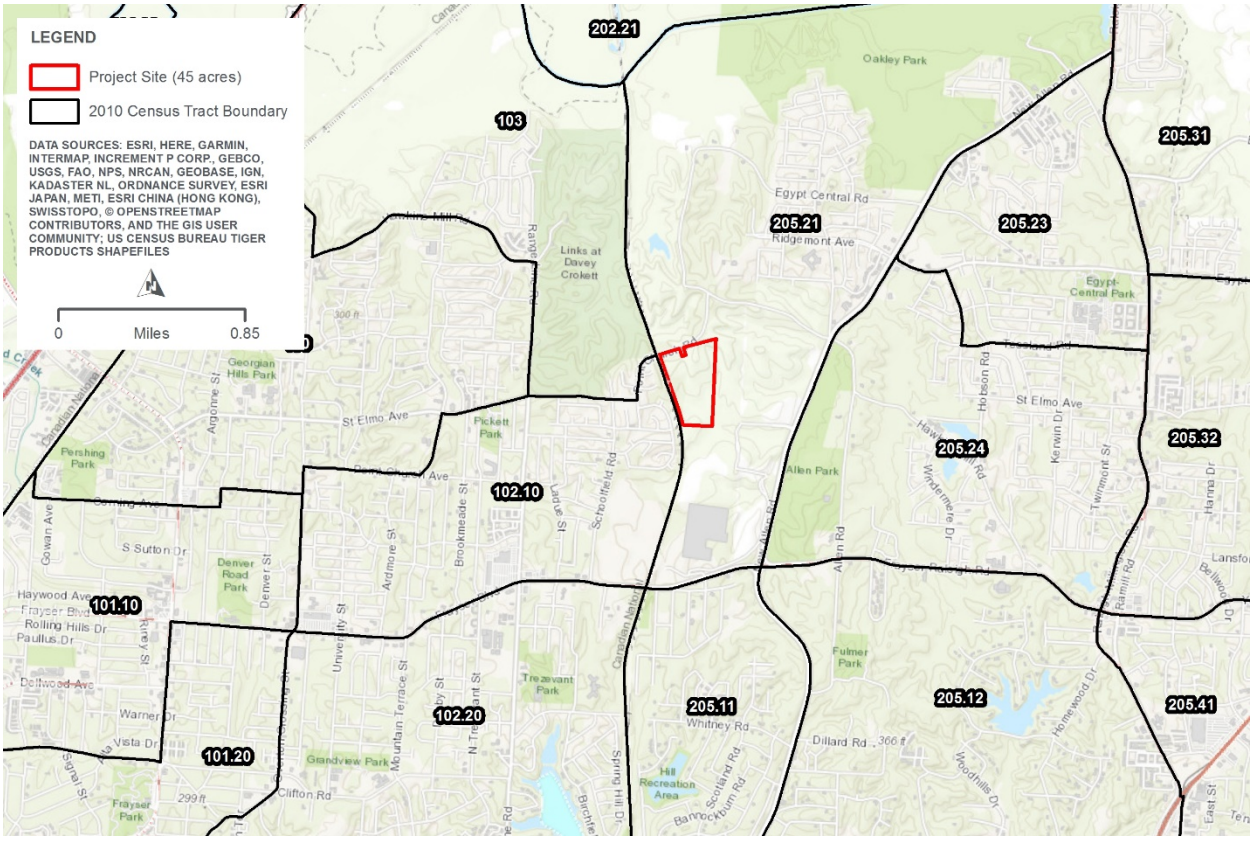


Figure 3-9. 2010 US Census tracts in Shelby County.

Table 3.11-1. Socioeconomic data for the project area, Shelby County, and Tennessee.

Census categories	Project Area (CT 205.21)	Shelby County	Tennessee
Population 2010	3,693	927,644	6,346,105
Population, 2016 5-yr. est.	3,844	936,990	6,548,009
Population change, 2010 and 2016 (%)	4.09	1.01	3.18
Total civilian employment, 2016 5-yr. est.	1,397	427,281	2,937,131
Unemployment rate, 2016 5-yr. est. (%)	13.8	9.4	7.5
Minority population, 2016 5-yr. est. (%)	92.6	60.4	22.2
Hispanic population, 2016 5-yr. est. (%)	1.1	6.0	5.0
Median household income, 2016 5-yr. est.	$24,336	$46,854	$46,574
Per capita income, 2016 5-yr. est.	$10,501	$26,963	$26,019
Persons below poverty, 2016 5-yr. est. (%)	45.7	21.4	17.2

Sources: USCB 2010, 2016a, 2016b

EO 12898 (59 FR 7629) directs federal agencies to identify and address, as appropriate, potential disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Although TVA is not subject to this EO, its policy is to consider environmental justice in its environmental reviews.

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

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

According to CEQ guidance, USCB data are typically used to determine minority and low-income population percentages in the affected area of a project in order to conduct a quantitative assessment of potential environmental justice impacts. In 2016, the poverty income threshold for an individual of any age with no children under 18 years of age in the household was $12,228 (Semega et al. 2017). This figure is higher than the average per capita income for the project area

(Table 3.11-1). The official 2016 poverty rate for the US as a whole was 12.7 percent, lower than that of the project area, where 45.7 percent lived below the poverty level.

3.11.2 Environmental Consequences

This section describes the potential impacts on socioeconomic resources or to low-income or minority populations in the project area should the Proposed Action or No Action Alternative 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 socioeconomic or environmental justice-related impacts would occur. Existing land use would be expected to remain a mix of residential, industrial, and unused land, and existing socioeconomic conditions and environmental justice considerations would be expected to remain as they are at present.

3.11.2.2 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 4 months to complete with a maximum crew of 60 workers at the site during the peak of construction. Workers would include a mix of general laborers, electrical technicians, and journeyman-level electricians. Work would generally occur 6 days a week (Monday through Saturday) from 7 am to 3:30 pm. 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/or services would be purchased locally in the Shelby County area, as well as in adjacent counties. Also, approximately 80 percent of the construction workforce would likely be from local or regional sources within a 50-mile radius of the project site. Approximately 20 percent of the workforce would be supervisory personnel likely coming from out-of-state. The direct impact to the economy associated with construction 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/or services. Construction of the proposed facility could have minor beneficial indirect impacts to population and short-term employment and income levels in Shelby County and the City of Memphis.

During operation of the solar facility, a temporary workforce of three to four employees would be on site for mowing on a quarterly basis. One to two people would also be on site during biannual inspections of the solar facility. Grounds maintenance and some other operation and maintenance activities may be conducted by local contractors. The facility would not receive a tax abatement; thus minor increases in property and business tax payments would be expected. Overall, operations of the solar facility would have a small, positive impact on employment in Shelby

County. Overall, socioeconomic impacts for the operation of the proposed solar facility would be positive and long-term, while small relative to the total economy of the region.

The proportions of minority and low-income populations near the proposed solar facility are greater than Shelby County and state proportions. The per capita income within the project site's CT is less than half the per capita-income averages in either the county or the state. While minority and low-income populations are prominent in the project area, the overall impacts of the solar facility, most of which would occur during the short, approximate 4-month construction period, would be minor and indirect, off-site impacts (i.e., to surrounding properties) would be negligible. Consequently, there would be no disproportionately adverse impacts to minority and low-income populations resulting from the Proposed Action.

.

CHAPTER 4

4.0 ANTICIPATED ENVIRONMENTAL 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.

4.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The Proposed Action could cause some unavoidable adverse environmental effects (see Table 2.3-1). Specifically, construction activities would temporarily increase noise and traffic as well as impact the air quality and visual aesthetics of the general area. Construction activities would be limited to daytime hours, which would help minimize noise impacts. Tree buffers surrounding the project site on the east, west, and north perimeters of the project site would minimize effects to visual resources, during both construction and operation. The Project would expand industrial land uses to the north, where these practices are zoned but not presently occurring. Some long-term habitat loss would also occur due to loss of 26.3 acres of forest on the project site.

With the application of appropriate BMPs, no unavoidable adverse effects to groundwater or surface water other than wetlands are expected. Minor unavoidable adverse impacts affecting 0.0005 acre of wetland are anticipated. No direct adverse effects to federally listed species are expected, and indirect effects to federally listed bat species, if present on the project site, would be minor. No adverse effects to the area population of the state-listed barn owl are expected.

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 undeveloped, open-field and forested land to solar power generation. The effects on long-term productivity would be minimal as existing land uses could be readily restored on the solar facility 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.

CHAPTER 5

5.0 CUMULATIVE IMPACTS

Cumulative impacts are defined as the effects of the Proposed Action when considered together with other past, present, and reasonably foreseeable future actions. Chapter 3, Affected Environment and Environmental Consequences, presents information about past and present environmental conditions, as well as future trends, where appropriate. This chapter addresses the cumulative impacts of the Project and any reasonably foreseeable action in the vicinity.

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

- Local and regional news sources
- City of Memphis government website records, including city council meeting agendas and meeting minutes and public notices from the joint City of Memphis-Shelby County DPD
- Shelby County website, including business and economic development information
- Area chamber of commerce and other local business association websites
- TDOT website, including the Statewide Project Overview Tracker (SPOT) GIS application showing current and proposed future TDOT projects (TDOT 2018b)
- TVA website
- *Federal Register*

Most major developments in the vicinity of the project site occur in or near downtown Memphis, located approximately 10 miles to the southwest. The proposed Project would result in minor direct, adverse effects to land use, soils, water resources, biological resources, visual resources, noise, air quality, and transportation. The cumulative impact of the effects of the Proposed Action when added to ongoing and future actions in the general area surrounding the project would be insignificant.

5.1 FEDERAL PROJECTS

This section addresses other federal projects in the vicinity of the project site with possible adverse effects to land use, soils, water resources, biological resources, visual resources, noise, air quality, and transportation.

One federal project was identified in the vicinity of the project area. Plans continue for a completed Interstate 69 (I-69) that will connect Mexico and Canada (with Shelby County firmly as its hub). Interstate 69 (I-69) is a proposed highway that was identified as a priority in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) (TDOT 2018c). I-69 currently exists from the US-Canadian border in Michigan to northeastern Indianapolis, Indiana. Congress passed legislation to extend the I-69 corridor southward to the Lower Rio Grande Valley. The extension of the

corridor incorporates several elements, including a new interstate route (I-69) that will serve Memphis, Tennessee. The proposed route has been divided into multiple segments that are individually being evaluated for environmental impacts. One of the segments, Segment 9, is located in proximity to the proposed Project.

Segment 9 begins near the I-55/SR 304 Interchange in Hernando, Mississippi, and extends north to near the intersection of US 51 and SR 385 in Millington, Tennessee. A Final Environmental Impact Statement and Record of Decision have been issued for this Segment of the I-69 project (SIU9 FEIS; TDOT 2018d). The SIU9 FEIS evaluated a no-build alternative and a systems approach alternative that assessed two routes through the Memphis area: one passing through Memphis and another bypassing Memphis to the east. Construction of SIU9 would result in construction of approximately 45 miles of new roadway, 15 miles of which are in the vicinity of the current project site. Both routes considered to span these 15 miles would have land use, socioeconomic, farmland, and water resource impacts.

While many segments of the proposed I-69 would follow existing highway alignments, roads would need to be widened and new segments are proposed that would affect residential, agricultural, or undeveloped land. Thus, the proposed I-69 project has the potential to contribute to cumulative impacts on land use, geological resources and farmlands, visual resources, noise, and air quality in the area. In addition, the proposed highway would affect wetlands and surface waters; however, compensatory mitigation would be required to offset unavoidable impacts to these resources.

While the Project is expected to result in minor direct impacts to land use, soils, water resources, biological resources, visual resources, noise, air quality, and transportation, the Project would not result in significant cumulative effects on these resources due to minimization efforts and implementation of BMPs.

5.2 STATE AND LOCAL PROJECTS

No state or locally funded projects are in the vicinity of the project site with the potential to contribute to cumulative impacts associated with the Proposed Action. Recent public hearings held by the Memphis City Council and associated city council meeting agendas and meeting minutes demonstrate that current and reasonably foreseeable development projects that may affect the same resources as the Project are generally concentrated in central, south, and east Memphis and are not in the vicinity of the project site. The same distribution of current or planned TDOT projects is apparent on the SPOT GIS application (TDOT 2018b).

CHAPTER 6

6.0 LIST OF PREPARERS

6.1 PROJECT TEAM

Table 6.1-1 presents the members of the Project team and summarizes the expertise and contributions made to this EA by each member.

Table 6.1-1. SR Innovation Environmental Assessment Project Team

Name/Education	Experience	Project role
TVA		
Travis A. Giles M.S. Environmental Science, B.S. Environmental Policy Program Manager Environmental	17 years in environmental policy and permitting	NEPA compliance and document preparation
Elizabeth B. Hamrick M.S., Wildlife; B.S., Biology Zoologist	17 years conducting field biology, 12 years technical writing, 8 years NEPA and ESA	Wildlife; threatened and endangered terrestrial animals
Michaelyn Harle Ph.D., Anthropology; M.A. Anthropology; B.A. Anthropology Archaeologist	15 years in cultural resource management	Cultural resources, NHPA Section 106 compliance
William D. White B.S., Forestry NEPA Specialist	15 years in water resource permitting and NEPA compliance	NEPA compliance and document preparation
HDR		
Thomas Blackwell, PWS M.S., Environmental Resource Management; B.A. Natural Science (Geography)	12 years in stream and wetland delineations and restoration design, permitting, NEPA documentation, and project management	Environmental Planner, document preparation and QA/QC
Benjamin Burdette, EIT M.S., Environmental Engineering	5 years in environmental sciences, NEPA coordination and document preparation at the EIS level	GIS mapping
Mark P. Filardi, P.G. M.S. and B.S., Geology	19 years in hydrogeology and contaminated site assessment and remediation	Document preparation and QA/QC

Name/Education	Experience	Project role
Josh Fletcher, RPA M.A., Anthropology (Archaeology); B.S., Architectural Design	20 years in cultural resources management, regulatory compliance, NEPA documentation, and project management	Environmental Planner, document preparation and QA/QC
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 and QA/QC
Jason McMaster, PWS M.S., Environmental Science; M.A., Biology; B.S., Business Administration	10 years in combined regulatory compliance, preparation of environmental review documents, and project management	Environmental Scientist, document preparation
Charles P. Nicholson Ph.D., Ecology and Evolutionary Biology; M.S., Wildlife Management; B.S., Wildlife and Fisheries Science	40 years in zoology, endangered species studies, and NEPA compliance	NEPA Compliance, document QA/QC
Harriet L. Richardson Seacat M.A., Anthropology (Cultural); B.A., Anthropology (Native American Studies minor)	17 years in anthropology, archaeology, history, and NHPA and NEPA documentation	Project Manager, Environmental Planner, document preparation, GIS mapping, field work
Miles Spenrath B.S., Environment and Natural Resources	6 years in NEPA compliance	GIS mapping
Kelly Thames, PWS M.S., Plant Biology; B.A., Environmental Science	6 years in combined regulatory compliance, preparation of environmental review documents, and project management	Environmental Scientist, document preparation and QA/QC, GIS mapping, field work
Blair Goodman Wade, ENV SP M.E.M., Environmental Management; B.S., Integrated Sciences and Technology (Environmental Science and GIS)	13 years in regulatory compliance, NEPA documentation, and mitigation planning	Sr. Environmental Planner, document QA/QC

CHAPTER 7

7.0 REFERENCES

Bebon, Joseph. 2017. Tennessee Valley Authority Awards 10 MW Under Solar Pilot Program. Accessed October 16, 2018 athttps://solarindustrymag.com/tennessee-valley-authority-awards-10-mw-solar-pilot-program/.

Brahana, J.V., and R.E. Broshears. 2001. *Hydrogeology and Ground-water Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee*. Water-Resources Investigations Report 89-4131. U.S. Department of the Interior, U.S. Geological Survey, Memphis, Tennessee.

California Department of Transportation (Caltrans). 2018. Loudness Comparison Chart (dBA). Accessed August 9, 2018 at http://www.dot.ca.gov/dist2/projects/sixer/loud.pdf.

Conant, R., and J. T. Collins. 1998. *A Field Guide to Reptiles and Amphibians: Eastern and Central North America*. 3rd ed. Boston: Houghton Mifflin.

Cornell University. 2017a. All About Birds: American Kestrel. Cornell Lab of Ornithology, Cornell University. Accessed on July 26, 2018 at https://www.allaboutbirds.org/guide/American_Kestrel/overview.

_____. 2017b. All About Birds: Prothonotary Warbler. Cornell Lab of Ornithology, Cornell University. Accessed on July 26, 2018 at https://www.allaboutbirds.org/guide/Prothonotary_Warbler.

Cowardin, L.M., Carter, V., Golet, F.C., and LaRoe, E.T. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Washington, D.C.

Executive Order 11988, Floodplain Management, Federal Register, Volume 42, No. 101-Wednesday, May 25, 1977. pp. 26951-26957.

Federal Emergency Management Act (FEMA). 2018. FEMA Flood Map Service Center. Accessed on July 20, 2018 at https://msc.fema.gov/portal/.

Jackson Group. 2018. Bat Survey Report, Silicon Ranch Corporation, SR Innovation Project, Shelby County, Tennessee. Prepared for HDR, Inc. by Jackson Group, Richmond, Kentucky.

Karpynec, Ted, Meghan Weaver, Heidi de Gregory, Monica Warner, Cristina Oliveira, and Elinor Crook. 2018. A Phase I Cultural Resources Survey of a Planned 2-MW Solar Array in Memphis, Shelby County, Tennessee. Prepared for Silicon Ranch Corporation, Nashville, Tennessee, by Tennessee Valley Archaeological Research, Huntsville, Alabama.

Kays, R, and D E. Wilson. 2002. *Mammals of North America*. Princeton University Press, Princeton, NJ.

Kurta, A., S. W. Murray, and D. H. Miller. 2002. Roost selection and movements across the summer landscape. Pages 118-129 *in* A. Kurta and J. Kennedy, editors. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Memphis, City of (Memphis). 2018a. DPD GIS Viewer/Zoning Atlas. Accessed on June 26, 2018 at http://mapgis.memphistn.gov/Applications/DPDGov/.

_____. 2018b. Solid Waste Management. Accessed on September 9, 2018 at https://www.memphistn.gov/government/public_works/solid_waste_management.

Memphis, City of, and Shelby County (Memphis and Shelby County). 2010. The Memphis and Shelby County Unified Development Code. Accessed on September 6, 2018 at https://shelbycountytn.gov/DocumentCenter/View/32498/ZTA-18-001-Complete-Document-4.

Memphis Light, Gas and Water Division (MLGW). 2017. MLGW awarded solar generation project through TVA Distributed Solar Solutions pilot. Accessed on October 15, 2018 at http://www.mlgw.com/news/tva-nike-solar-project-may-2017.

National Geographic. 2002. *A Field Guide to the Birds of North America.* 4th ed. National Geographic Society Washington, D.C.

National Land Cover Database (NLCD). 2016. Multi-Resolution Land Characteristics Consortium (MRLC). Accessed on June 26, 2018 at https://www.mrlc.gov/eva/viewer.html.

NatureServe. 2018. NatureServe Explorer. Accessed on August 8, 2018 at http://explorer.natureserve.org.

Niemiller, M.L, and R.G. Reynolds. 2011. *The Amphibians of Tennessee*. The University of Tennessee Press, Knoxville.

Nike, Inc. (Nike). 2015. Nike opens its largest distribution center worldwide in Tennessee. Accessed on July 31, 2018 at https://news.nike.com/news/nike-opens-its-largest-distribution-center-worldwide-in-tennessee.

Paleontology Portal. 2018. Tennessee, US: Paleontology and geology. Accessed on August 24, 2018 at http://paleoportal.org/index.php?globalnav=time_space&sectionnav=state&name=Tennessee.

Parker, Patricia L. and Thomas F. King. 1998. (revised) *Guidelines for Evaluating and Documenting Traditional Cultural Properties.* National Register Bulletin 38. U.S. Department of the Interior, National Park Service, Cultural Resources. Washington, D.C.

Parks, W.S. and J.K. Carmichael. 1990. *Geology and Ground-water Resources of the Memphis Sand in Western Tennessee.* Water-Resources Investigations Report 88-4182. U.S. Department of the Interior, U.S. Geological Survey, Memphis, Tennessee.

Pruitt, L., and L. TeWinkel, editors. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 258 pages.

Quarry, Sean and Hong T. Spores. 2018. *Phase I Environmental Site Assessment: Silicon Ranch Corporation, SR Innovation, Memphis, Shelby County, Tennessee*. Prepared by HDR for Silicon Ranch Corporation.

Saatkamp, Andrew. 2007. *Archaeological Assessment of a Proposed 2,400 ft. Access Road Northwest of Frayser Boulevard and New Allen Road, Shelby County, Tennessee*. Prepared by Panamerican Consultants, Inc., for TDOT.

Semega, Jessica L., Kayla R. Fontenot, and Melissa A. Kollar. 2017. Income and Poverty in the United States: 2016. Report Number P60-259. US Department of Commerce, Economics and Statistics Administration, US Census Bureau. Accessed on August 16, 2018 at https://www.census.gov/content/dam/Census/library/publications/2017/demo/P60-259.pdf.

Shelby County. 2013. Roadway Functional Classification System for Shelby County, TN. Accessed on August 15, 2018 at https://shelbycountytn.gov/DocumentCenter/View/13569/Functional-Class-Map-revised-2013?bidId=.

_____. 2018. Planning & Development. Accessed on June 26, 2018 at http://shelbycountytn.gov/18/Planning-Development.

Silicon Ranch Corporation (SRC). 2017. Silicon Ranch, MLGW & Nike Collaboration. Accessed on October 16, 2018 at https://www.silconranch.com/src-and-mlgw-collaboration.

Stallings, Richard. 2016. *Phase I Archaeological Survey of the New Allen Road Intersection at Hawkins Mill Road, Shelby County, Tennessee*. Prepared by AMEC Foster Wheeler Environment & Infrastructure, Inc., for TDOT.

Taylor, Janis L. 2016. Mississippi Valley Loess Plains. Accessed July 25, 2018 at https://landcovertrends.usgs.gov/east/eco74Report.html.

Tennessee Bat Working Group. 2018a. Indiana Bat. Accessed August 8, 2018 at http://www.tnbwg.org/TNBWG_MYSO.html.

_____. 2018b. Northern Long-eared Bat. Accessed August 8, 2018 at http://www.tnbwg.org/TNBWG_MYSE.html.

Tennessee Department of Environment and Conservation (TDEC). 2003. Loosahatchie River Watershed (08010209) of the Mississippi River Basin, Watershed Water Quality

Management Plan. Tennessee Department of Environment and Conservation, Division of Water Pollution Control: Watershed Management Section.

_____. 2009. Tennessee SHPO Standards and Guidelines for Archaeological Resource Management Studies. Accessed August 14, 2018 at https://www.tn.gov/content/dam/tn/environment/archaeology/documents/arch_shpo_sg.pdf.

_____. 2016. Tennessee Ground Water Monitoring and Management. Ground Water 305(b) Report. Tennessee Department of Environment and Conservation, Divisions of Water Resources, Drinking Water Unit.

_____. 2018a. Generalized Geologic Map of Tennessee. Accessed July 6, 2018 at https://www.tn.gov/content/dam/tn/environment/geology/images/geology_geologic-map-lg.jpg.

_____. 2018b. Rare Species Data Viewer. Accessed July 26, 2018 at http://tdec.tn.gov:8080/pls/enf_reports/f?p=9014:3:0:.

Tennessee Department of Transportation (TDOT). 2018a. Traffic History. Accessed August 15, 2018 at https://www.tdot.tn.gov/APPLICATIONS/traffichistory.

_____. 2018b. Statewide Project Overview Tracker (SPOT). Accessed September 6, 2018 at https://www.tdot.tn.gov/projectneeds/spot#/.

_____. 2018c. Interstate 69 Corridor. Accessed September 6, 2018 at https://www.tn.gov/tdot/projects/region-4/interstate-69-corridor.html.

_____. 2018d. Interstate 69 – Segment 9. Accessed September 6, 2018 at https://www.tn.gov/content/tn/tdot/projects/region-4/interstate-69-segment-9.html.

Tennessee Historical Commission (THC). 1991. Tennessee's Historical and Architectural Survey Manual. Tennessee Historical Commission, Nashville.

Tennessee State Government (Tennessee). 2018. Forest Resources Conditions. Tennessee Forest Resources Assessment and Strategy, Tennessee State Government. Accessed July 26, 2018 at https://www.tn.gov/content/dam/tn/agriculture/documents/forestry/TN-FAP_2-Conditions.pdf.

Tennessee Valley Authority (TVA). 1983. Procedures for Compliance with the National Environmental Policy Act. Accessed July 26, 2018 at https://www.tva.com/file_source/TVA/Site%20Content/Environment/Environmental%20Stewardship/Environmental%20Reviews/tvanepa_procedures.pdf.

_____. 2011. Final Integrated Resource Plan, TVA's Environmental & Energy Future. TVA, Chattanooga, Tennessee.

_____. 2014. TVA Solar Photovoltaic Projects Final Programmatic Environmental Assessment. Accessed September 6, 2018 at https://www.tva.gov/file_source/TVA/Site%20Content/Environment/Environmental%20Stewardship/Environmental%20Reviews/TVA%20Solar%20Photovoltaic%20Projects/PV-final%20PEA-Solar%20PV-reduced%20size.pdf.

_____. 2015. Integrated Resource Plan. Final Supplemental Environmental Impact Statement. Accessed September 10, 2018 at https://www.tva.com/Environment/Environmental-Stewardship/Integrated-Resource-Plan/2015-Integrated-Resource-Plan.

_____. 2016. Bull Run Fossil Plant Landfill Draft Environmental Impact Statement, Anderson County, Tennessee. Accessed July 31, 2018 at https://www.tva.com/file_source/TVA/Site%20Content/Environment/Environmental%20Stewardship/Environmental%20Reviews/Disposal%20of%20Coal%20Combustion%20Residuals%20from%20the%20Bull%20Run%20Fossil%20Plant/2016_0523%20Bull%20Run%20Draft%20EIS.pdf.

_____. 2017. Programmatic Biological Assessment for Evaluation of the Impacts of Tennessee Valley Authority's Routine Actions on Federally Listed Bats. TVA, Knoxville, Tennessee.

_____. 2018a. Memphis Solar Project. Accessed November 28, 2018 at https://www.tva.com/Environment/Environmental-Stewardship/Environmental-Reviews/Memphis-Solar-Project.

_____. 2018b. Regional Natural Heritage Database results for project site and 10-mile radius. Data provided by TVA August 6, 2018.

US Census Bureau (USCB). 2010 Decennial Census 2010: DP01 for CT 205.21, Shelby County, and Tennessee. Accessed on August 16, 2018 via American FactFinder at https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t.

_____. 2016a American Community Survey 2012 – 2016 5-Year Estimates: DP05 for CT 205.21, Shelby County, and Tennessee. Accessed on August 16, 2018 via American FactFinder at https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t.

_____. 2016b American Community Survey 2012 – 2016 5-Year Estimates: DP03 for CT 205.21, Shelby County, and Tennessee. Accessed on August 16, 2018 via American FactFinder at https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t.

_____. 2018. TIGER Products. Accessed September 14, 2018 at https://www.census.gov/geo/maps-data/data/tiger.html.

US Department of Agriculture (USDA). 1971. November 7, 1971 single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 1980. November 1, 1980 single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 1995. Landscape Aesthetics: A Handbook for Scenery Management. Agriculture Handbook Number 701. US Forest Service, US Department of Agriculture. Accessed on July 31, 2018 at https://www.fs.fed.us/cdt/carrying_capacity/landscape_aesthetics_handbook_701_no_append.pdf.

_____. 2007. Single frame aerial photograph, 1 inch equals 500 feet. US Department of Agriculture, National Agriculture Imagery Program. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 2010. Single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 2014. Single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 2018. Web Soil Survey. Accessed on July 5, 2018 at http://websoilsurvey.nrcs.usda.gov/.

US Department of Transportation (USDOT). 2015. "Construction Noise Handbook." US Department of Transportation, Federal Highway Administration. Accessed August 9. 2018 at https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/.

US Environmental Protection Agency (USEPA). 1974. Information on Levels of Environmental Noise Requisite To Protect Public Health And Welfare With An Adequate Margin of Safety. March 1974. Prepared By the U.S. Environmental Protection Agency Office Of Noise Abatement And Control.

_____. 1998. *Emission Factor Documentation for AP-42 Section 12.3.3. Unpaved Roads. Final Report.* Accessed on August 14, 2018 at https://www3.epa.gov/ttnchie1/ap42/ch13/bgdocs/b13s02-2.pdf.

_____. 2014. The 2014 National Emissions Inventory Data. Accessed on August 14, 2018 at: https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data.

_____. 2017. Flight database: 2016 Greenhouse Gas Emissions from Large Facilities. Accessed on August 15, 2018 at https://ghgdata.epa.gov/ghgp/main.do.

_____. 2018a. NEPAssist. Accessed on September 10, 2018 at https://nepassisttool.epa.gov/nepassist/nepamap.aspx.

_____. 2018b. Ecoregions of Tennessee. Accessed on July 6, 2018 at ftp://newftp.epa.gov/EPADataCommons/ORD/Ecoregions/tn/tn_eco_lg.pdf.

_____. 2018c. Nonattainment Areas for Criteria Pollutants (Green Book). Accessed September 3, 2018 at https://ejscreen.epa.gov/mapper/.

_____. 2018d. Status of SIP Required Elements for Tennessee Designated Areas, as of August 12, 2018. Accessed on August 14, 2018 at https://www3.epa.gov/airquality/urbanair/sipstatus/reports/tn_elembypoll.html#co__1971__173.

_____. 2018e. Greenhouse Gas Inventory Data Explorer. Accessed on August 15, 2018 at https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/index.html#allsectors/allgas/gas/all.

_____. 2018f. Tennessee Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants, as of 6/30/2018. Accessed on 8/15/2018 at https://www3.epa.gov/airquality/greenbook/anayo_tn.html.

US Fish and Wildlife Service (USFWS). n.d. Endangered Species Act Status Codes. Environmental Conservation Online System, US Fish and Wildlife Service. Accessed on August 7, 2018 at https://www.ecos.fws.gov/ecp0/html/db-status.html.

_____. 1918. *The Migratory Bird Treaty Act of 1918*. Accessed on August 14, 2018 at https://www.fws.gov/laws/lawsdigest/migtrea.html.

_____. 2014. Northern Long-eared Bat Interim Conference and Planning. Accessed on August 14, 2018 at https://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf.

_____. 2015. Threatened Species Status for the Northern Long-eared Bat with 4(d) Rule. April 2015. Accessed on August 14, 2018 at https://www.gpo.gov/fdsys/pkg/FR-2015-04-02/pdf/2015-07069.pdf.

_____. 2018a. Information for Planning and Conservation: Project Site Location, Shelby County, Tennessee. Accessed on July 26, 2018 at http://ecos.fws.gov/ipac/.

_____. 2018b. Environmental Conservation Online System: Species Profile for Indiana Bat (*Myotis sodalis*). Accessed July 26, 2018, https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=5949.

_____. 2018c. Environmental Conservation Online System: Species Profile for Northern Long-Eared Bat (*Myotis septentrionalis*). Accessed July 26, 2018, https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=9045.

US Geological Survey (USGS). 1973. March 1, 1973 single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 1986. April 23, 1986 single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 1990. February 12, 1990 single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 1992. February 29, 1992 single frame aerial photograph, 1 inch equals 500 feet. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 1997. January 29, 1997 single frame aerial photograph, 1 inch equals 500 feet. US Geological Survey, Digital Orthophoto Quarter Quad. Accessed on May 4, 2018 by Environmental Data Resources, Inc. for HDR.

_____. 2014. Information by Region – Tennessee: 2014 Seismic Hazard Map. Accessed September 11, 2018 at https://earthquake.usgs.gov/earthquakes/byregion/tennessee-haz.php.

_____. 2016a. Unconsolidated and semiconsolidated sand and gravel aquifers. Accessed on July 11, 2018 at https://water.usgs.gov/ogw/aquiferbasics/uncon.html.

_____. 2016b. Aquifer Basics: Mississippi embayment aquifer system. Accessed on July 11, 2018 at https://water.usgs.gov/ogw/aquiferbasics/embay.html.

_____. 2018a. Mississippi Valley Loess Plains. Accessed June 5, 2018 at https://www.sciencebase.gov/catalog/item/55c77fc6e4b08400b1fd8390.

_____. 2018b. Latest Earthquakes. Accessed July 6, 2018 at https://earthquake.usgs.gov/earthquakes/map/.

_____. 2018c. *National Hydrography Dataset*. Accessed on June 20, 2018 at http://nhd.usgs.gov/.

_____. 2018d. The National Map: Topographic Maps (1:24,000-scale) Quadrangles. Accessed June 20, 2018 at https://nationalmap.gov/ustopo/.

US Water Resources Council. 1978. "Floodplain Management Guidelines for Implementing E.O. 11988." *Federal Register* 43:6030, February 10, 1978.

Appendix A
Alternatives Eliminated from Further Consideration

This page intentionally left blank.

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 to screen potential locations and ultimately eliminate those sites that did not provide the needed attributes. This process of review and refinement ultimately led to the consideration of the current project site.

The site screening process involved considering sites in proximity to the Nike NALC-Memphis facility due to the Project partnership with Nike. This included ensuring the availability of nearby electric infrastructure for interconnection. Additional screening consisted of 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;
- Ability to avoid and/or minimize impacts to known sensitive biological, visual and cultural resources.

This page intentionally left blank.

Appendix B

USACE Letter Concurring with Preliminary Jurisdictional Determination

This page intentionally left blank.

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT CORPS OF ENGINEERS
167 NORTH MAIN STREET B-202
MEMPHIS, TENNESSEE 38103-1894

October 11, 2018

Ms. Kelly Thames, PWS
HDR Engineering, Inc.
440 South Church Street
Charlotte, North Carolina 28202

Dear Ms. Thames:

This is in response to your request for a preliminary jurisdictional determination (PJD) on a property located in north Memphis, Shelby County, Tennessee. The site is located at Latitude 35.234798°N and Longitude -89.962212°W and is depicted in the enclosed maps. Based on the information submitted to our office and a site visit conducted by our staff on October 3, 2018, we concur with your delineation. If you wish to provide additional information, you may request an approved jurisdictional determination.

The PJD is included for concurrence. If you agree with this PJD please sign the form and return it to the address listed above. If the PJD is not returned within 30 days of the date of this letter we will assume your concurrence. A PJD cannot be appealed. If you object to this PJD, please see Section I.E. of the attached Notification of Administrative Appeal Options and the Process and Request for Appeal Form, on how to proceed or call the Memphis District Regulatory Branch for assistance at the number listed below.

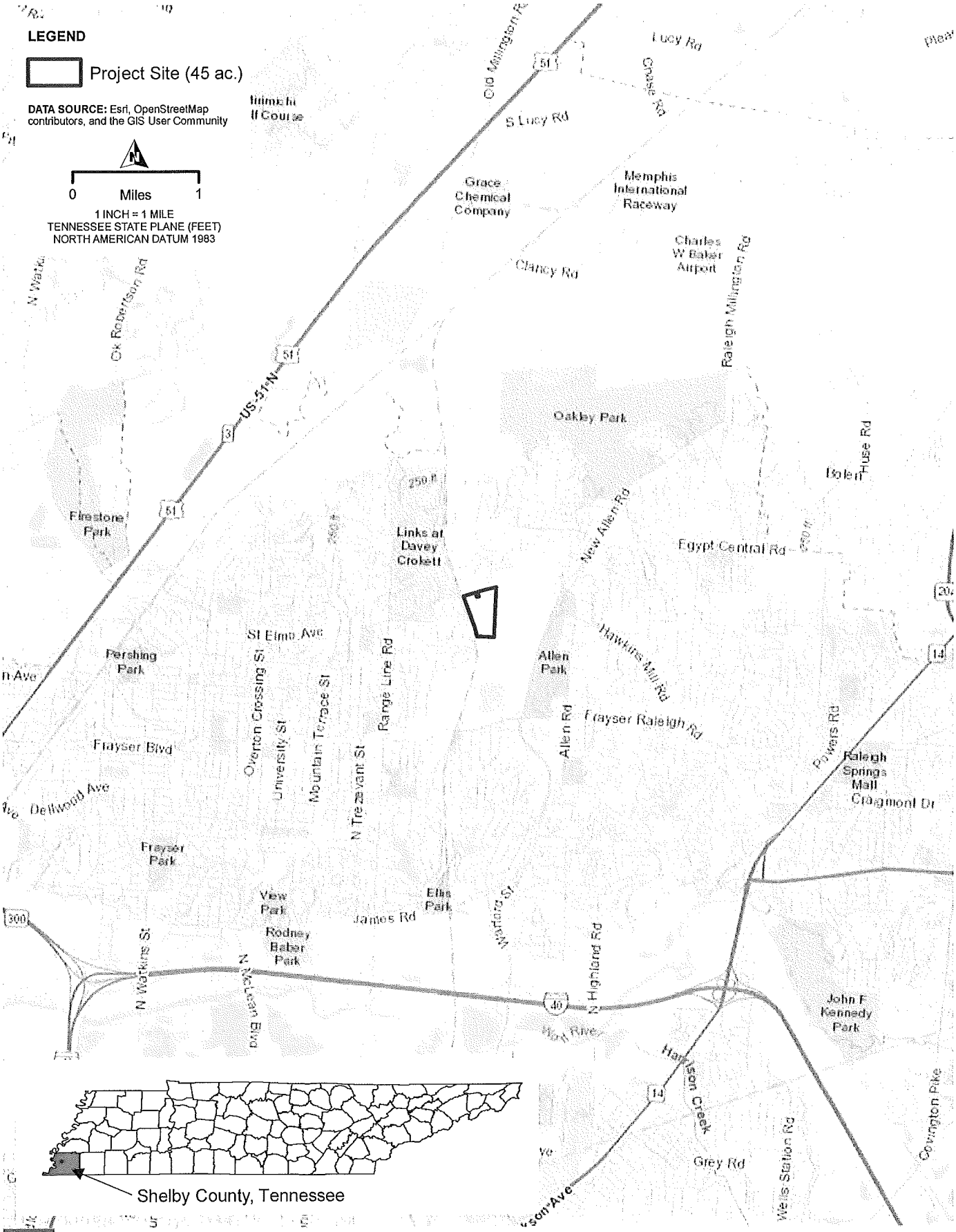
The Memphis District Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, we invite you to complete a Customer Service Survey found on our web site at http://corpsmapu.usace .army.mil/cm_apex/f?p=regulatory_survey. Your comments, positive or negative, will not affect any current or future dealing with the Corps of Engineers.

If you have questions, please contact Danny Keating at (901) 544-0733 and refer to File No. MVM-2018-281.

Sincerely,

for Roger S. Allan
Supervisor
Regulatory Branch

Enclosures



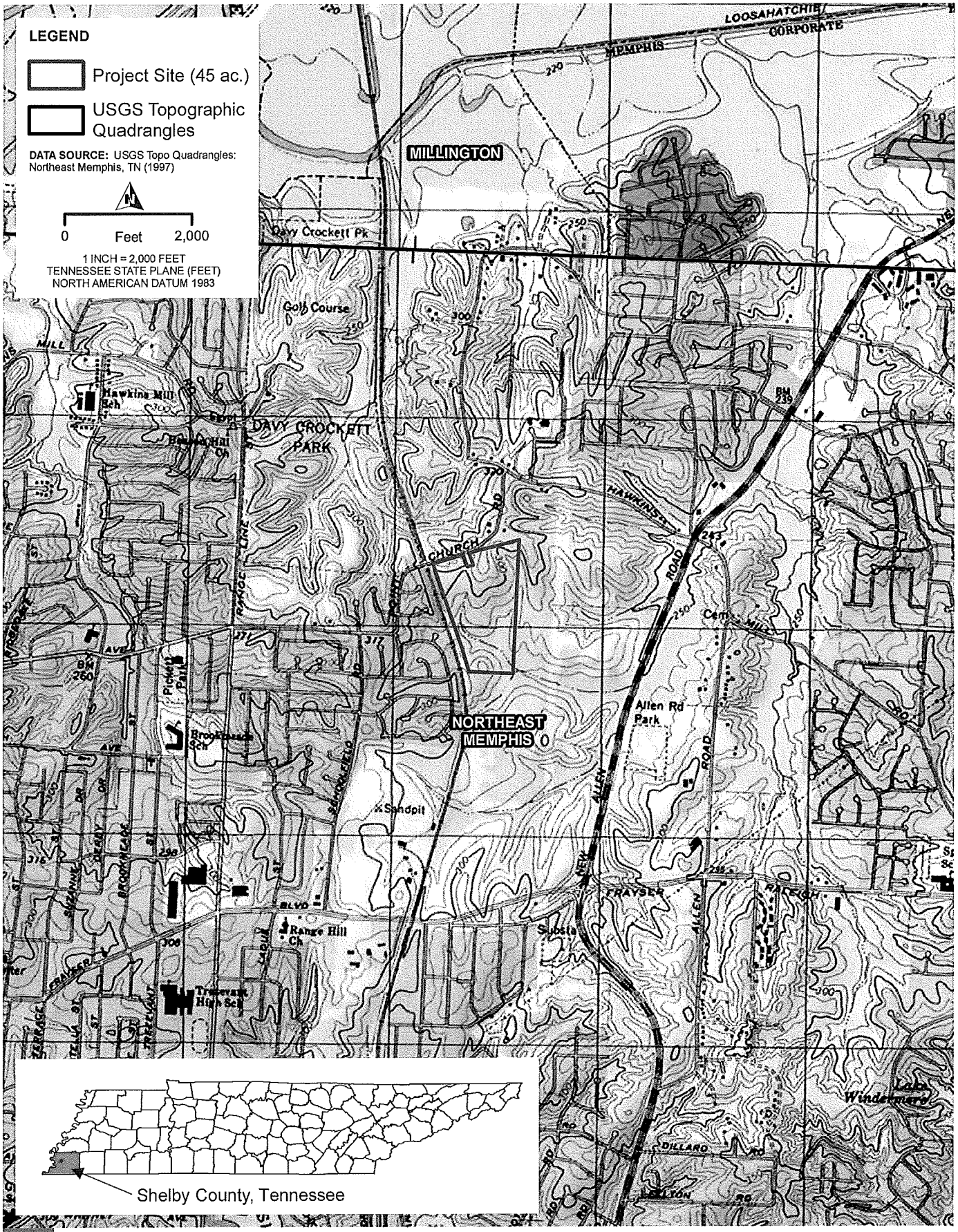
SR INNOVATION

PROJECT LOCATION

FIGURE 1

PATH: V:\PROJECTS\10532_SILICONRANCHCORPORATION\10055923_NIKE\V.2_WORK_IN_PROGRESS\MAP_DOCS\MXD\JD\01_INNOVATION_PROJVIC.MXD
USER: KTHAMES - DATE: 6/15/2018

PRELIMINARY JURISDICTIONAL DETERMINATION



SR INNOVATION

USGS TOPOGRAPHIC QUADRANGLES

FIGURE 2

PATH: V:\PROJECTS\10532_SILICONRANCHCORPORATION\10055923_NIKE\7.2_WORK_IN_PROGRESS\MAP_DOCS\MXD\JD\02_INNOVATION_USGS.MXD
USER: KTHAMES - DATE: 6/15/2018

PRELIMINARY JURISDICTIONAL DETERMINATION

SR INNOVATION

AERIAL IMAGERY

FIGURE 3

PATH: V:\PROJECTS\10532_SILICONRANCHCORPORATION\10065923_NIKEV.2_WORK_IN_PROGRESS\MAP_DOCS\MXD\JD\03_INNOVATION_AERIAL.MXD
USER: KTHAMES - DATE: 6/15/2018

PRELIMINARY JURISDICTIONAL DETERMINATION

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: July 10, 2018

B. NAME AND ADDRESS OF PERSON REQUESTING PJD:

Kelly Thames
HDR, Inc.
440 S. Church Street, Suite 1000
Charlotte, NC 28202
kelly.thames@hdrinc.com
704-338-6710

on behalf of

Ali Weaver
SR Innovation, LLC
222 2nd Avenue, Suite 1900
Nashville, TN 37201
ali.weaver@siliconranchcorp.com
615-577-4611

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: **MVM-2018-0281(CDK)**

(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: Tennessee County/parish/borough: Shelby County City: Memphis (closest city)

Center coordinates of site (lat/long in degree decimal format): Lat.: 35.234798° Long.: -89.962212°

Universal Transverse Mercator: NAD 83

Name of nearest waterbody: Loosahatchie River (Lower Loosahatchie River, HUC# 080102090406)

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:

☒ Field Determination. Date(s): May 14 and 15, 2018; USACE personnel visited the site on 03 October 2018.

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Perennial RPW Stream 1	35.233559°	-89.962984°	Length: 457 ft. Width: 4 ft. Acres: 0.04 ac.	non-wetland waters	Section 404, non-section 10
Wetland 1	35.23279°	-89.960862°	Length: n/a Width: n/a Acres: 0.80 ac.	wetland waters	Section 404, non-section 10

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre- construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map:_____

☒ Data sheets prepared/submitted by or on behalf of the PJD requestor.

☒ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report. Rationale:_____

☐ Data sheets prepared by the Corps:_____

☐ Corps navigable waters' study:_____

☐ U.S. Geological Survey Hydrologic Atlas:_____

☒ USGS NHD data.

☐ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name: 1":24,000' Northeast Memphis, TN (1997)

☒ Natural Resources Conservation Service Soil Survey. Citation: NRCS Soils Survey of Shelby Co. (2017)

☒ National wetlands inventory map(s). Cite name: USFWS NWI (2017)

☐ State/local wetland inventory map(s):_____

☒ FEMA/FIRM maps:_____

☐ 100-year Floodplain Elevation is:_____ (National Geodetic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): National Geographic Society, i-cubed (Bing.com) (2013)
or ☒ Other (Name & Date): Site photographs, dated May 14-15, 2018

☐ Previous determination(s). File no. and date of response letter:_____

☐ Other information (please specify):_____

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

10 October 2018
Signature and date of Regulatory staff member completing PJD

Kelly Thames 8/30/2018
Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

Appendix C

Bat Survey Report and Notification 412394 to USFWS

This page intentionally left blank.

BAT SURVEY REPORT

SILICON RANCH CORPORATION
SR INNOVATION PROJECT
SHELBY COUNTY, TENNESSEE

Prepared by:

Jackson Group
3945 Simpson Lane
Richmond, KY 40475
www.jacksongroupco.com

Prepared for:

May 2018

This page intentionally left blank

EXECUTIVE SUMMARY

This summer mist-net survey was conducted under the appropriate conditions to investigate the presence/probable absence of threatened and endangered bat species at the proposed SR Innovation Project in Memphis, Tennessee. The proposed project area was surveyed by Jackson Group biologists who are state and federally permitted (TN Permit No. 1645; USFWS Recovery Permit No. TE65346A-1) on 22-24 May 2018.

No threatened or endangered bat species were captured during the survey efforts, therefore no radio tracking was conducted.

Survey results from this mist-net survey will be used to assess risk to threatened or endangered bat species at the SR Innovation Project and determine if avoidance or minimization measures are required during the summer maternity season during the operational phase of the Project. The lack of captures of threatened or endangered species is considered sufficient evidence that threatened or endangered species are not present within the Project during the summer maternity season.

TABLE OF CONTENTS

1.0 INTRODUCTION

Jackson Group was contracted by HDR, Inc. (HDR) to conduct an Indiana bat (*Myotis sodalis*) and northern long-eared bat (*M. septentrionalis*) presence/absence survey for Silicon Ranch Corporation for the SR Innovation Project (Project) located in Shelby County, Tennessee to determine if threatened and endangered bat species are present in the Project area during the summer maternity season. The surveys methods described in this survey report meet the survey effort recommended within the US Fish and Wildlife Service (USFWS) "2018 Range-wide Indiana Bat Summer Survey Guidelines" for bat mist-net surveys.

The following document details the findings of the approved bat survey conducted by Jackson Group on behalf of the SR innovation Project, to assess risk to threatened or endangered bat species at the Project, and determine if avoidance or minimization measures are required during the summer maternity season during the operational phase of the Project.

2.0 SITE LOCATION

The proposed 45 ± acres project is located in Memphis, Shelby County, Tennessee. A project location map can be found in Appendix A.

3.0 MIST NET SURVEY

3.1 Methods

To address federally and threatened bat species presence/probable absence within the project area, Jackson Group conducted a mist net survey accordance with the guidelines established in the Range-Wide Indiana Bat Summer Survey Guidelines (USFWS 2018). Surveys were conducted between 22 May and 24 May 2018. To determine the level of effort required to satisfy regulatory concerns, the project area was assessed to determine the presence of potential suitable summer habitat. This data was used to develop a study plan that included the proposed site location and methods to conduct the survey. The study plan was provided to, and subsequently approved by, applicable state agencies and by the local Tennessee USFWS Field Office.

As stated in the 2018 Guidelines; for every 123 acres (0.5km^2) of potential summer habitat a minimum of 9 net nights of survey effort is required, therefore one net site was established within the 45 ± acre Project area. Final location of the one site was selected by a qualified bat biologist in the field and was based on the best possible net placement (e.g., streams, trails) that are typically the most effective places to survey. The survey was conducted for three consecutive nights using three net sets each night for a total of nine net nights of survey effort. Additionally, all netting was conducted using the most current National White-Nose Syndrome Decontamination Protocol (Version 04.12.2016).

Net sets consisted of three nets suspended between two poles. The nets were tiered and raised and lowered using a pulley system.

If captured, bats will be removed from the nets, identified to species, weighed, measured, and released unharmed near the point of capture. The following data was recorded for each individual captured: species, age, reproductive condition, right forearm length (RFA), weight, time of capture, and WNS damage index score based upon Reichard and Kunz's (2009) Wing Damage Index. All bats were identified to species based upon distinctive morphological characteristics (e.g. body size, hair color, ear length, tragus shape, presence/absence of a keeled calcar, etc.). Age was determined by the degree of epiphyseal – diaphyseal fusion. Adult female bats were considered reproductive

if they were pregnant (based upon palpation of the abdomen), or bore signs of nursing young (i.e. lack of hair surrounding the teats). Males were considered reproductive if the testes were descended into the scrotum.

4.0 RESULTS

4.1 Mist Net Survey

No bats were captured during the survey efforts. Detailed site specific capture information and site diagrams can be found on the Mist Net Survey Data sheets in Appendix B and mist net site photographs can be found in Appendix C.

4.2 Radio Telemetry

No Indiana or northern long-eared bats were captured during survey efforts; therefore no radio tracking was conducted.

5.0 DISCUSSION

5.1 Overview

The summer mist net survey was conducted with the appropriate level of effort and under the appropriate conditions to investigate presence/absence of threatened and endangered bat species. No bats were captured during the survey efforts.

Given that no species were captured during the survey, it is the opinion of Jackson Group that the proposed SR Innovation Project will not likely adversely affect threatened and endangered bat species populations in the area.

6.0 LITERATURE CITED

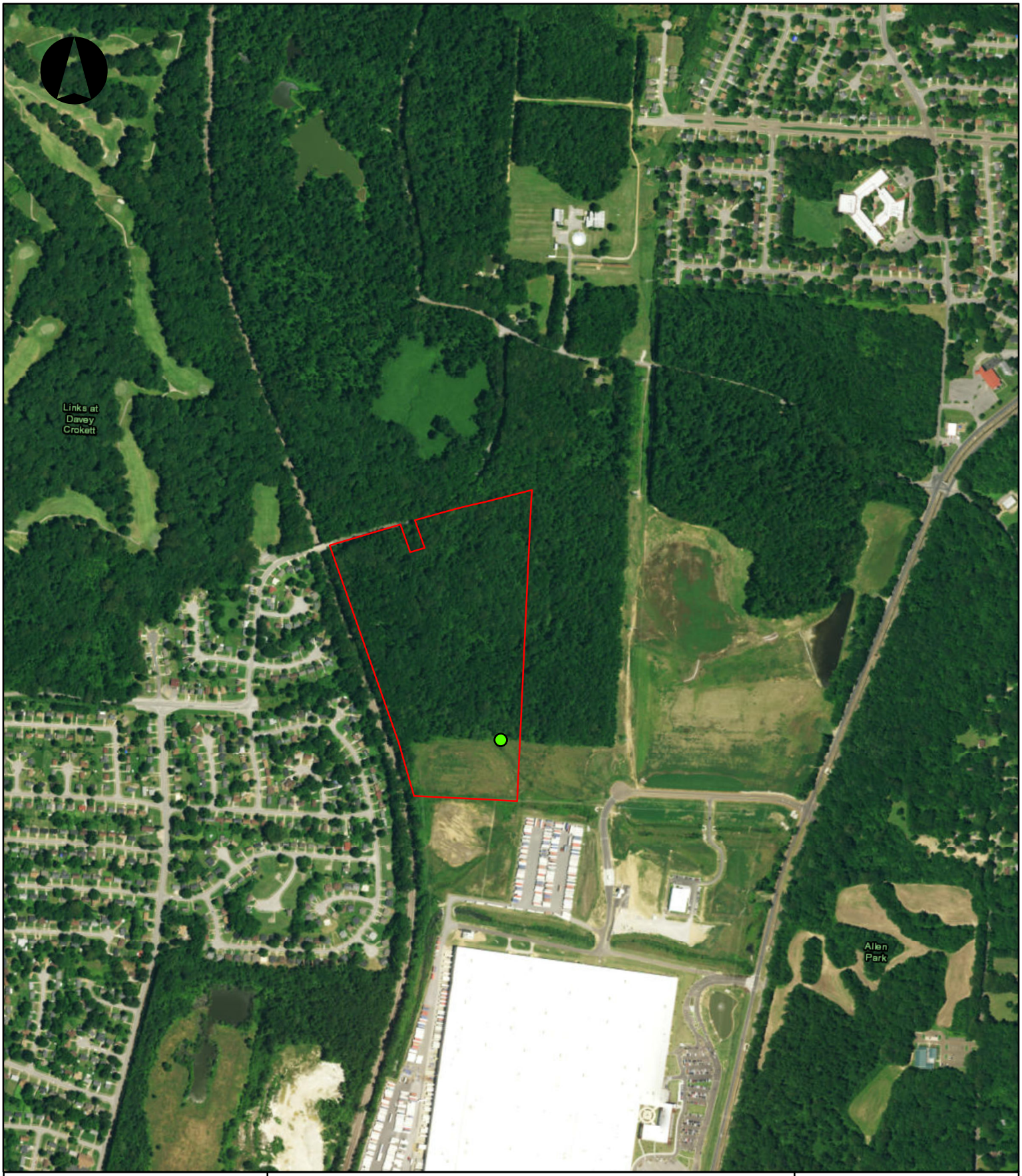
USFWS (U. S. Fish and Wildlife Service). 2018. Range-Wide Indiana bat Summer Survey Guidelines, April 1. 44 pg.

USFWS (U. S. Fish and Wildlife Service). 2016. National White-Nose Syndrome Decontamination Protocol. (Version 04.12.2016)

APPENDIX A

PROJECT MAPPING

This page intentionally left blank



Legend

Project Boundary

Survey Site Location

630 315 0 630 Feet

SR Innovation Project

Bat Survey Location Map

Shelby County, Tennessee

JACKSON GROUP

HDR

This page intentionally left blank

APPENDIX B

COMPLETED BAT SURVEY DATA SHEETS

This page intentionally left blank

Bat Capture Data Sheet

Site No: MS-1	**Project No.:** 10065923	**Company:** Jackson Group	**Project Name:** SR Innovation Project	**Date:** 05/22/2018
Location: New Allen Road		**Pipeline Segment:** NA	**KM Block No.** NA	**Approx. Mile Post:** NA
County: Shelby		**State:** TN	**Surveyor(s):** Shane Roberts	
Lat/Long	**N** 35.233018	**W** -89.960947	**Quad:**	**Tract No.:** NA

#	Time	Species	Age	Sex	Repro. Cond **	RFA (MM)	Mass (g)	Wing Score*	Band No.	Guano/ Hair	Net Name	Net Height	Photo
1		No Bats Captured											
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													

*Wing Score: (**0**) No Damage; (**1**) Light Damage (<50%); (**2**) Moderate Damage (>50%); (**3**) Heavy Damage - deteriorated wing membrane with isolated holes

** Repro. Cond (Reproductive Condition): (**P**) Pregnant; (**L**) Lactating; (**PL**) Post-lactating; (**NR**) Non-reproductive; (**TD**) Testes descended

Moon Phase: Waxing Gibbous

	Rise	Set
Moon	12:55	2:19
Sun	5:27	7:51

Time	Temp	Sky	Wind	# Bats
7:21	79	2	1	0
8:21	76	2	1	0
9:21	74	2	1	0
10:21	74	2	1	0
11:21	73	2	1	0
12:21	73	2	1	0

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or Overcast
4	Smoke or Fog
5	Drizzle or Light Rain
6	Thunderstorm

Beauford Wind Code	
0	Calm (0 mph)
1	Light Wind (1-3 mph)
2	Light Breeze (4-7 mph)
3	Gentle Breeze (8-12 mph)
4	Moderate Breeze (13-18 mph)

Acoustic Unit Serial No: NA

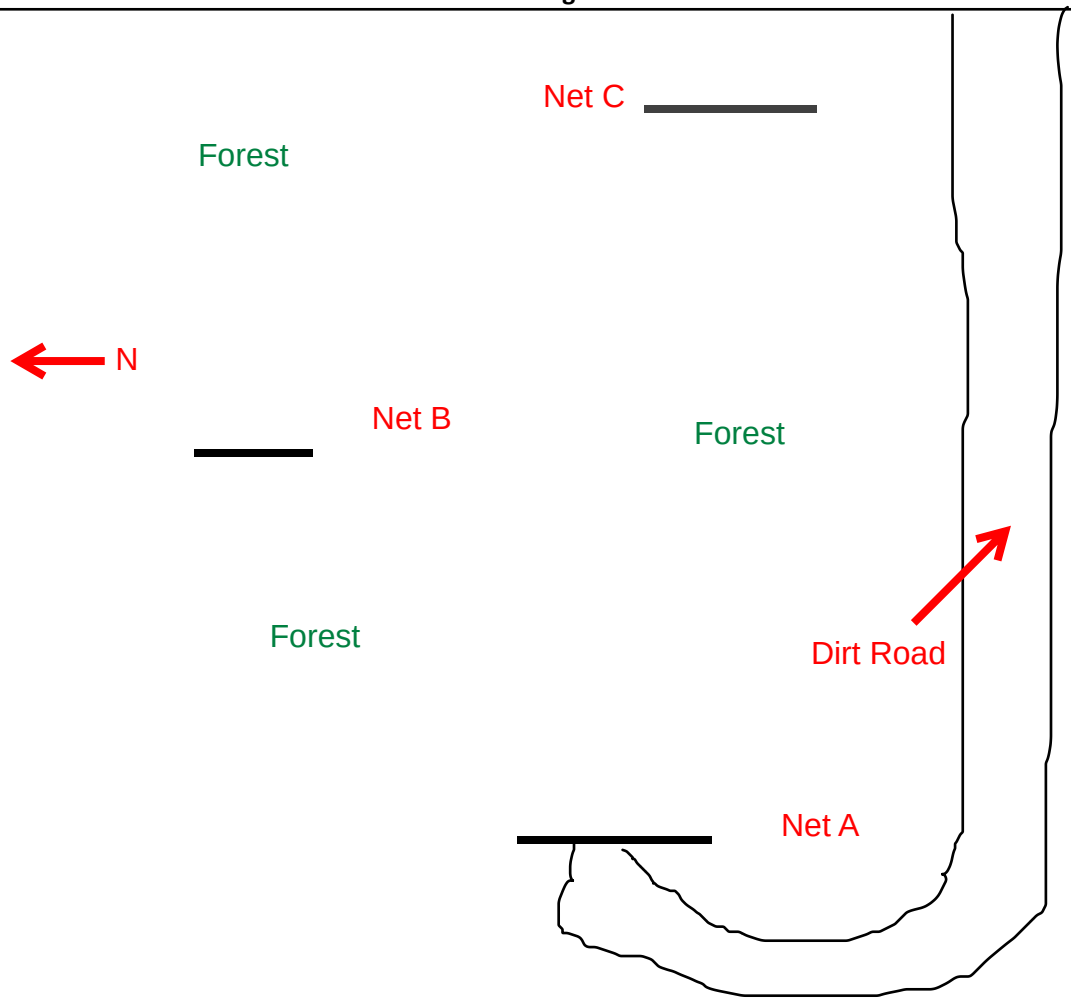
Lat: N

Long: W

JACKSON GROUP

Bat Capture Data Sheet

Net Site Diagram



Dominant Vegetation

1	Tulip poplar
2	Sycamore
3	Box elder
4	
5	

Other Species:

Dogwood
Bitternut hickory
Black walnut

Net Site(s) by Habitat

Habitat	A	B	C	D	
River					
Stream					
Pond					
Road Rut	X				
Corridor		X	X		
Cave/Mine					
Total					

	No. of Nets	X	Net Height	X	Net Width	Total Area
A	2	X	6 m	X	6 m	
B	2	X	6 m	X	6 m	
C	2	X	6 m	X	6 m	
D		X		X		

Comments:

Net B 35.23341, -89.961006 Net C 35.233821, -89.961118

JACKSON GROUP

Bat Capture Data Sheet

Site No: MS-1	**Project No.:** 10065923	**Company:** Jackson Group	**Project Name:** SR Innovation Project	**Date:** 05/23/2018
Location: New Allen Road		**Pipeline Segment:** NA	**KM Block No.** NA	**Approx. Mile Post:** NA
County: Shelby		**State:** TN	**Surveyor(s):** Shane Roberts	
Lat/Long	**N** 35.233018	**W** -89.960947	**Quad:**	**Tract No.:** NA

#	Time	Species	Age	Sex	Repro. Cond **	RFA (MM)	Mass (g)	Wing Score*	Band No.	Guano/ Hair	Net Name	Net Height	Photo
1		No Bats Captured											
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													

*Wing Score: (**0**) No Damage; (**1**) Light Damage (<50%); (**2**) Moderate Damage (>50%); (**3**) Heavy Damage - deteriorated wing membrane with isolated holes

** Repro. Cond (Reproductive Condition): (**P**) Pregnant; (**L**) Lactating; (**PL**) Post-lactating; (**NR**) Non-reproductive; (**TD**) Testes descended

Moon Phase: Waxing Gibbous

	Rise	Set
Moon	2:19	3:10
Sun	5:49	8:03

Time	Temp	Sky	Wind	# Bats
7:33	82	3	2	0
8:33	80	3	1	0
9:33	77	2	1	0
10:33	75	2	1	0
11:33	74	2	1	0
12:33	74	2	1	0

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or Overcast
4	Smoke or Fog
5	Drizzle or Light Rain
6	Thunderstorm

Beauford Wind Code	
0	Calm (0 mph)
1	Light Wind (1-3 mph)
2	Light Breeze (4-7 mph)
3	Gentle Breeze (8-12 mph)
4	Moderate Breeze (13-18 mph)

Acoustic Unit Serial No: NA

Lat: N

Long: W

JACKSON GROUP

Bat Capture Data Sheet

Net Site Diagram	Dominant Vegetation
	1 Tulip poplar
	2 Sycamore
	3
	4
	5

Other Species:
Dogwood
Bitternut hickory
Black walnut

Net Site(s) by Habitat

Habitat	A	B	C	D	
River					
Stream					
Pond					
Road Rut	X				
Corridor		X	X		
Cave/Mine					
Total					

	No. of Nets	X	Net Height	X	Net Width	Total Area
A	2	X	6 m	X	6 m	
B	2	X	6 m	X	6 m	
C	2	X	6 m	X	6 m	
D		X		X		

Comments:

Net B 35.23341, -89.961006 Net C 35.233821, -89.961118

No bats observed flying

JACKSON GROUP

Bat Capture Data Sheet

Site No: MS-1	**Project No.:** 10065923	**Company:** Jackson Group	**Project Name:** SR Innovation Project	**Date:** 05/24/2018
Location: New Allen Road		**Pipeline Segment:** NA	**KM Block No.** NA	**Approx. Mile Post:** NA
County: Shelby		**State:** TN	**Surveyor(s):** Shane Roberts	
Lat/Long	**N** 35.233018	**W** -89.960947	**Quad:**	**Tract No.:** NA

#	Time	Species	Age	Sex	Repro. Cond **	RFA (MM)	Mass (g)	Wing Score*	Band No.	Guano/ Hair	Net Name	Net Height	Photo
1		No Bats Captured											
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													

*Wing Score: (**0**) No Damage; (**1**) Light Damage (<50%); (**2**) Moderate Damage (>50%); (**3**) Heavy Damage - deteriorated wing membrane with isolated holes

** Repro. Cond (Reproductive Condition): (**P**) Pregnant; (**L**) Lactating; (**PL**) Post-lactating; (**NR**) Non-reproductive; (**TD**) Testes descended

Moon Phase:
Waxing Gibbous

	Rise	Set
Moon	3:23	3,44
Sun	5:50	8:04

Time	Temp	Sky	Wind	# Bats
7:34	78	2	1	0
8:34	76	2	1	0
9:34	72	2	1	0
10:34	72	2	1	0
11:34	71	2	1	0
12:34	71	2	1	0

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or Overcast
4	Smoke or Fog
5	Drizzle or Light Rain
6	Thunderstorm

Beauford Wind Code	
0	Calm (0 mph)
1	Light Wind (1-3 mph)
2	Light Breeze (4-7 mph)
3	Gentle Breeze (8-12 mph)
4	Moderate Breeze (13-18 mph)

Acoustic Unit Serial No:
NA

Lat: N

Long: W

JACKSON GROUP

Bat Capture Data Sheet

Net Site Diagram	Dominant Vegetation
	1 Tulip poplar
	2 Sycamore
	3
	4
	5

Other Species:
Dogwood
Bitternut hickory
Black walnut

Net Site(s) by Habitat					
Habitat	**A**	**B**	**C**	**D**	
River					
Stream					
Pond					
Road Rut	X				
Corridor		X	X		
Cave/Mine					
Total					

	No. of Nets	X	Net Height	X	Net Width	Total Area
A	2	**X**	6 m	**X**	6 m	
B	2	**X**	6 m	**X**	6 m	
C	2	**X**	6 m	**X**	6 m	
D		**X**		**X**		

Comments:

Net B 35.23341, -89.961006 Net C 35.233821, -89.961118

No Bats observed flying

JACKSON GROUP

APPENDIX C

PHOTOGRAPHS

This page intentionally left blank

MS-1 Net A

MS-1 Net B

MS-1 Net C

This page intentionally left blank

APPENDIX D

COLLECTING PERMITS

This page intentionally left blank

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

Scientific Collection Permit : 1645 **Issue date:** 4/30/2018 **Expiration date:** 4/30/2019

Pursuant to authority of T.C.A. 70-2-213: Jeremy Jackson

and the following additional permittees:

Robert C. Oney federal recovery permit # TE 65002A-1
Shane Roberts federal recovery permit # TE 65346A-1
Tyler Newman federal recovery permit # TE 11044C-0
Amanda Janicki (Amanda is a sub-permittee on federal recovery permit # TE TE07358A-10 for T&E bat species.)
Rex Medlin (Rex is a sub-permittee on federal recovery permit TE102202-12 for T&E bat species.)

are granted permission to take the following species:

Little Brown Bat (Myotis lucifugus), Southeastern Bat (Myotis austroriparius), Gray Bat (Myotis grisescens), Northern Long-eared Bat (Myotis septentrionalis), Indiana Bat (Myotis sodalis), Eastern Small-footed Bat (Myotis leibii), Tri-colored Bat (Perimyotis subflavus), Big Brown Bat (Eptesicus fuscus), Rafinesque's Big-eared Bat (Corynorhinus rafinesquii), Eastern Red Bat (Lasiurus borealis), Seminole Bat (Lasiurus seminolus), Hoary Bat (Lasiurus cinereus), Silver-haired Bat (Lasionycteris noctivagans), Evening Bat (Nycticeius humeralis), Brazilian Free-tailed Bat (Tadarida brasiliensis),

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

Scientific Collection Permit : 1645 **Issue date:** 4/30/2018 **Expiration date:** 4/30/2019

Pursuant to authority of T.C.A. 70-2-213: Jeremy Jackson

and the following additional permittees:

Robert C. Oney federal recovery permit # TE 65002A-1
Shane Roberts federal recovery permit # TE 65346A-1
Tyler Newman federal recovery permit # TE 11044C-0
Amanda Janicki (Amanda is a sub-permittee on federal recovery permit # TE TE07358A-10 for T&E bat species.)

Restricted to the following locations:

Belz Property in Shelby County, Tennessee

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

Scientific Collection Permit: 1645 **Issue date:** 4/30/2018 **Expiration date:** 4/30/2019

Pursuant to authority of T.C.A. 70-2-213:
Jeremy Jackson

and the following additional permittees:
Robert C. Oney federal recovery permit # TE 65002A-1
Shane Roberts federal recovery permit # TE 65346A-1
Tyler Newman federal recovery permit # TE 11044C-0
Amanda Janicki (Amanda is a sub-permittee on federal recovery permit # TE TE07358A-10 for T&E bat species.)
Rex Medlin (Rex is a sub-permittee on federal recovery permit TE102302-12 for T&E bat species.)

Restricted to the following collection methods:
Mist nets following the 2018 Range-wide Indiana Bat Survey Guidelines.

Subject to the following rules:

Wildlife may not be held longer than 24 hours without prior approval. All containers and equipment utilized in the collection of amphibians and reptiles shall be decontaminated and disinfected for ranavirus and other pathogens. This permit is invalid unless accompanied by all applicable federal permits.

No species listed by TWRA as endangered, threatened, in need of management, or of greatest conservation need may be taken without approval; release these species immediately. Report the occurance of endangered or threatened species to TWRA within five days.

Prior to collecting in the field, you are required to notify the TWRA Regional Dispatcher with the name(s) of person(s) doing the collecting, where, when and what species you will be collecting. Contact information is attached.

Ed Carter

Executive Director, Tennessee Wildlife Resources Agency

4/30/2018
Date

The State of Tennessee

AN EQUAL OPPORTUNITY EMPLOYER

DEPARTMENT OF THE INTERIOR
U.S. FISH & WILDLIFE SERVICE
Ecological Services Permit Office
1875 Century Boulevard
Atlanta, GA 30345
permitsR4ES@fws.gov

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

MATTHEW S ROBERTS
319 BRANDON COURT
BEREA, KY 40403
U.S.A.

2. AUTHORITY-STATUTES
16 USC 1539(a)

REGULATIONS
50 CFR 17.22

50 CFR 13

3. NUMBER
TE65346A-1 AMENDMENT

4. RENEWABLE ☒ YES ☐ NO

5. MAY COPY ☒ YES ☐ NO

6. EFFECTIVE
06/02/2016

7. EXPIRES
05/31/2021

8. NAME AND TITLE OF PRINCIPAL OFFICER *(If #1 is a business)*

9. TYPE OF PERMIT
NATIVE ENDANGERED SP. RECOVERY - E WILDLIFE

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
Location: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL, TRIBAL, OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

C. 1. The following individual is authorized to conduct activities as authorized by this permit: Matthew S. Roberts.

Trained assistants not named on this permit may work on permitted bat activities under the direct and on-site supervision of the individual named above. However, trained assistants may not work independently at a site. Trained assistants are individuals who are considered qualified by the permittee to select sampling sites, deploy sampling equipment and nets, and handle bats in the field. The permittee must remain present at each mist-net and harp trap site while they are being operated.

D. Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the terms of this permit and all sections of title 50 Code of Federal Regulations, parts 13 and 17, pertinent to issued permits. Section 11 of the Endangered Species Act of 1973, as amended, provides for civil and criminal penalties for failure to comply with permit conditions.

E. Permittee is authorized to take (enter hibernacula or maternity roost caves, capture with mist nets or harp traps, handle, identify, band, radio-tag, collect hair samples, and salvage) gray bats (*Myotis grisescens*), Indiana bats

☒ ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS
Annual reports are due by January 31 following each year this permit is in effect.

ISSUED BY	TITLE	DATE
	CHIEF, DIVISION OF ENVIRONMENTAL REVIEW	06/02/2016

(*Myotis sodalis*), and northern long-eared bats (*Myotis septentrionalis*) for presence/absence surveys, population monitoring, and studies to document habitat use, as described in permittee's January 11, 2012, and March 26, 2015, applications and as conditioned below.

F. The permitted activities described above require prior, site-specific approval from the USFWS Field Supervisor in the State(s) where the project will occur. Permittee shall notify the USFWS Field Supervisor for the State in which activities are proposed to occur at least 15 days prior to conducting any activities. Contact information is in Condition P., below. Your request for this site-specific approval must be in writing and must indicate:

F.1. The purpose and a description of the activities proposed (e.g., surveys, radio telemetry studies, etc.).

F.2. Location of proposed activities, including project site (legal description and lat/long), county, and state.

F.3. Dates when the project is proposed to take place.

F.4. You may proceed with activities only upon receipt of written concurrence from the applicable USFWS Field Supervisor. *Your concurrence letter must be carried with this permit to authorize site-specific activities.*

G. Permittee shall adhere to the following conditions involving capture and handling of bats:

G.1. Federally listed bats may be captured (e.g., mist-nets and harp traps) following the protocol(s) provided by the USFWS, when available. Permittees must contact the USFWS FO in the State(s) in which activities are proposed to ensure correct protocol(s) are used. For example, the current Range-wide Indiana Bat Summer Survey Guidelines are available at: http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html. The monitoring interval for mist nets is once every 10 minutes. Harp traps must be continually monitored.

G.2. Captured bats may be held for a maximum of 30 minutes, unless injured. If an exception is required to this prohibition, permittee must receive prior written approval from the USFWS Field Supervisor for the state in which the activities are proposed to occur.

G.3. Permittees shall carry out non-intrusive measurements on all captured bats. Data shall be recorded for all bats captured and include, but not be limited to, the data requested in any automated or species specific data form provided by the USFWS (e.g., USFWS Bat Reporting Form available at: http://www.fws.gov/midwest/Endangered/mammals/inba/inbasummersurveyguidance.html). Handling should be limited to the maximum extent practicable and should cease immediately at signs of undue stress (e.g., bat becoming unresponsive, etc.). Bats that appear stressed from handling should be placed in a dark, quiet location away from activity where it can safely fly away after recovery, and should be checked to ensure successful recovery before leaving the study site. Photographs of the identifying characteristics for each individual federally listed species captured are encouraged. The permittee may be requested to provide individual photographs after submittal of annual reporting data.

G.4. If bands are applied, they must be lipped metal bands having a unique identifier. Bands should be applied to the forearm of captured bats prior to release. No more than one band per bat may be used. Position the band on the wing so that when the bat is hanging upside down, the band numbers are right-side up. A single band should be placed on the right forearm of each male and the left forearm of each female bat.

G.5. Radio transmitters may be applied during spring, summer, and fall roosting and migration periods via nontoxic skin bond adhesive. The total weight of the transmitter may not exceed 5% of the bat's body weight and the total weight of the package (transmitter and adhesive) may not exceed 6% of the bat's body weight. The lightest package (both transmitter and adhesive) capable of accomplishing the required task should be used,

especially with pregnant females and newly volant juveniles. Bats carrying transmitters must be monitored daily for at least five days, or until the transmitter falls off, whichever occurs first.

G.6. Permittee may collect dorsal hair samples from captured bats. Hair samples shall be obtained via clipping fur from between scapula from females and juvenile males. The clipped area is the same area frequently clipped for radio transmitter attachment. All boards and equipment used to obtain samples must be disinfected according to the protocol cited in Condition G.8.

G.7. No capture activities shall occur within 20 meters of a known or potential summer or winter roost site, either natural or artificial, of a federally listed bat. If an exception is required to this prohibition, permittee must receive prior written approval from the USFWS Field Supervisor for the State in which the activities are proposed to occur.

G.8. Equipment used to capture and handle bats shall be cleaned and decontaminated, including personal gear such as boots and gloves, using products cited in decontamination guidelines and in compliance with label directions. The most recent decontamination guidance is found on the web at: <http://whitenosesyndrome.org/>

G.9. Caves, mines, or other suitable hibernation sites may be quietly searched in a manner that minimizes disturbance by utilizing the minimum number of people and time required to complete the survey. Surveys of known hibernacula conducted during the winter hibernation season shall follow the guidelines established in the recovery plans for each federally listed bat species with regards to how often a site may be visited and other species-specific requirements related to entering hibernaculum (for example, for Indiana bats, winter surveys should not be repeated more often than once every other year in any given hibernaculum), unless authorized by the appropriate Service Recovery Lead identified in Condition O (below).

Under no circumstances should multiple trips to the hibernation area occur within the same year without written approval of the USFWS Field Supervisor for the state in which activities are proposed.

Bats may be handled during winter surveys in order to collect band information and confirm the identification of listed species. When possible, bands should be read without touching the bat. Banded bats should only be handled if easily accessible and removal of the bat does not disturb a large number of additional bats and is unlikely to result in injury to the bat. Detailed photographs should be taken to document the presence of listed species in previously undocumented hibernaculum. Where hibernacula area and safety conditions allow, individuals entering hibernacula are recommended to utilize night vision goggles or red-filtered light and to remain in the site no more than 90 minutes to complete the work.

G.10. Surveys of gray bat maternity roosts and their other known summer roost sites shall be conducted by observing the bats with night vision equipment and/or infrared light sources (e.g., thermal infrared) as they emerge from their roosts to avoid any possible disturbance to these bats. At previously undocumented sites for these species, the accepted method to determine if they are present is to carefully and slowly enter the potential roost site to check for evidence of presence/use, such as visual observation of bats, significant quantities or a strong smell of guano, or the audible sounds produced by bats roosting at the site. As soon as any evidence is obtained that the roost site is being used by a federally listed bat species, survey team members shall immediately exit the roost site and make further observations from outside the entrance to the roost. All further observations shall be made from the entrance during the evening emergence.

H. Upon determination that endangered bats are present, permittee shall notify the following offices immediately (not to exceed 1 business day): the appropriate USFWS Regional Office (Condition N.), and the USFWS Field Office within the geographic location of study areas (Condition P.).

I. Permittee must carry a copy of this permit at all times when conducting the authorized activities. NOTE: This

permit is limited to the above activities and identified species.

J. Issuance of this permit does not constitute permission to conduct these activities on National Wildlife Refuges or any other public or private lands; such permission must be obtained separately from the appropriate landowner or land manager before beginning these authorized activities. This permit, neither directly nor by implication, grants the right of trespass.

K. The Service anticipates that no federally listed bats will be injured or killed as a result of permitted activities. In the event that any accidental injury or mortality occurs, all activities must cease and the injury or mortality reported immediately (not to exceed 1 business day) to the Southeast Regional Office listed in condition N.3. and to the Lead Recovery Biologist for the species (Condition O). The USFWS will work with the permittee to determine the cause of injury or mortality and whether such could be avoided should activities be allowed to proceed. Dead or moribund bats may be retained for further study only with the written permission of the USFWS. Any bats that are not authorized for retention are to be chilled and promptly transferred to the USFWS for potential necropsy and/or for scientific or educational purposes.

Upon locating a dead, injured, or sick bat, or any other threatened or endangered species, under circumstances not addressed in this authorization, initial notification must be made immediately (not to exceed 1 business day) to the appropriate Regional Office identified in Condition N., below, including a description of the circumstances, location information, and photo documentation. Notification should also be made at the same time to the appropriate USFWS Field Office identified in Condition P., below. Care should be taken in handling sick, injured, or dead specimens to ensure effective treatment or to preserve biological materials for later analysis. In conjunction with the care of sick or injured threatened or endangered species, and the preservation of biological materials from a dead animal, the permittee should take responsible steps to ensure that the site is not unnecessarily disturbed. Prior to collecting the specimen(s), you must photograph the specimen(s) to document the conditions in which they were found. You may preserve the specimen(s) by freezing them or other suitable method to allow scientific study. Disposition of collected specimen(s) shall be determined by the USFWS Field Office.

L. This permit is non-transferable.

M. Reports are due on January 31 following each year this permit is in effect. At a minimum, your report shall include:

M.1. The date, time, geographic locations (including datum and projection information).

M.2. All locations surveyed (regardless of whether federally listed bats were captured/observed).

M.3. Band numbers of all bats banded and all bats recovered/observed.

M.4. Information on any injuries and/or mortalities and disposition of specimens.

M.5. Location and characteristics of roost trees and bat colonies.

M.6. Copies of any separate reports and/or publications resulting from work conducted under the authority of this permit.

M.7. Data shall be submitted for all bats captured and include, but not be limited to, the data requested in any automated or species-specific data form provided by the USFWS (e.g., USFWS Bat Reporting Form available at: http://www.fws.gov/midwest/Endangered/mammals/inba/inbasummersurveyguidance.html). Photographs of the identifying characteristics for each individual federally listed species captured are encouraged. The permittee may

be requested to provide individual photographs after submittal of annual reporting data.

M.8. Copies of all site specific authorization letters required under Condition F.

IF NO ACTIVITIES OCCURRED OVER THE COURSE OF THE YEAR, INDICATION OF SUCH SHALL BE SUBMITTED AS AN ANNUAL REPORT.

N. Copies of your reports shall be sent to the offices listed below. When possible, electronic copies shall be submitted in lieu of hard copies in MS Word, Portable Document Format, Rich Text Format, or other file format that is compatible with the receiving office.

N.1.
Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service - Southwest Region (Region 2)
500 Gold Ave., SW
P.O. Box 1306
Albuquerque, New Mexico 87103-1306
(505/248-6665; fax 505/248-6788)
permitsR2ES@fws.gov

N.2.
Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service - Midwest Region (Region 3)
Ecological Services - Endangered Species
5600 American Blvd. W., Suite 990
Bloomington, Minnesota 55437-1458
(612/713-5343; fax 612/713-5292)
permitsR3ES@fws.gov

N.3.
Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service - Southeast Region (Region 4)
1875 Century Boulevard, Ecological Services
Atlanta, Georgia 30345-3301
(404/679-7101; fax 404/679-7081)
permitsR4ES@fws.gov

N.4.
Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service - Northeast Region (Region 5)
Endangered Species Division
300 Westgate Center Drive
Hadley, Massachusetts 01035-9589
(703/358-2402; fax 413/253-8482)
permitsR5ES@fws.gov <mailto:permitsR5ES@fws.gov>

N.5.
Regional Recovery Permits Coordinator & Assistant Regional Recovery Coordinator
U.S. Fish and Wildlife Service - Mountain-Prairie Region (Region 6)
Endangered Species Permits Office
Denver Federal Center, P.O. Box 25486

Denver, Colorado 80225-0489
(303/236-4212; fax 303/236-0027)
permitsR6ES@fws.gov

O. Additionally, based on the species, reports and publications shall be submitted to the following:

O.1. For activities/studies involving Indiana Bats:

Lori Pruitt, Recovery Lead
U.S. Fish and Wildlife Service
Indiana Ecological Services Field Office
620 S. Walker Street
Bloomington, Indiana 47403-2121
(812/334-4261 x1213; fax 812/334-4273)

O.2. For activities/studies involving Gray Bats:

Shauna Marquardt, Recovery Lead
U.S. Fish and Wildlife Service
Missouri Ecological Services Field Office
101 Park De Ville Drive, Suite A
Columbia, Missouri 65203
(573/234-2132 x174; fax 573/234-2181)

O.3. For activities/studies involving Northern Long-eared Bats:

Jill Utrup, Recovery Lead
U.S. Fish and Wildlife Service
Twin Cities Ecological Services Field Office
4104 American Blvd. E
Bloomington, Minnesota 55425
(612/725-3548 x207; fax 612/725-3609)

P. Additionally, based on geographic area, reports and publications shall be submitted to the following:

P.1. For studies conducted in Alabama:

Field Supervisor
Alabama Ecological Services Field Office
1208-B Main Street
Daphne, Alabama 36526-4419
(251) 441-5181

P.2. For studies conducted in Arkansas:

Field Supervisor
Arkansas Field Office
110 South Amity Road
Suite 300
Conway, Arkansas 72032-8975
(501) 513-4470

P.3. For studies conducted in Connecticut, Massachusetts, New Hampshire, Rhode Island and Vermont:

Field Supervisor
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301
(603) 223-2541

P.4. For studies conducted in Delaware and Maryland:

Field Supervisor
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401
(410) 573-4573

P.5. For studies conducted in North Florida:

Field Supervisor
North Florida Ecological Services Office
7915 Baymeadows Way
Suite 200
Jacksonville, FL 32256-7517
(904) 731-3336

P.6. For studies conducted in Georgia:

Field Supervisor
Georgia Field Office
105 Westpark Drive, Suite D
Athens, GA 30606-3175
(706) 613-9493; fax 706/613-6059

P.7. For studies conducted in Illinois:

P.7.a.
Kristen Lundh
Endangered Species Coordinator for Illinois/Iowa
U.S. Fish and Wildlife Service
Ecological Services Field Office
1511 47th Ave.
Moline, Illinois 61265
(309/757-5800, x215; fax 309/757-5807)

P.7.b.
Joe Kath
Endangered Species Coordinator
Illinois Department of Natural Resources
Division of Natural Heritage
One Natural Resource Way

Springfield, Illinois 62702-1271
(217/785-8764; fax 217/785-2438)

P.8. For studies conducted in Indiana:

P.8.a.
Lori Pruitt
Endangered Species Coordinator for Indiana
U.S. Fish and Wildlife Service
Ecological Services Field Office
620 S. Walker Street
Bloomington, Indiana 47403-2121
(812/334-4261 x1213; fax 812/334-4273)

P.8.b.
Scott Johnson
Indiana Department of Natural Resources
5596 East State Road 46
Bloomington, Indiana 47401
(812/334-1137, ext. 3400)

P.9. For studies conducted in Iowa:

P.9.a.
Kristen Lundh
Endangered Species Coordinator for Illinois/Iowa
U.S. Fish and Wildlife Service
Ecological Services Field Office
1511 47th Ave.
Moline, Illinois 61265
(309/757-5800, x215; fax 309/757-5807)

P.9.b.
Kelly Poole
Endangered Species Coordinator
Iowa Department of Natural Resources
Parks, Recreation, and Preserves
Wallace State Office Building
East 9th and Grand Avenue
Des Moines, Iowa 50319-0034
(515/281-8524)

P.10. For studies conducted in Kansas:

Field Supervisor
Kansas Field Office
2609 Anderson Avenue
Manhattan, Kansas 68502
785/539-3474; fax 785/539-8567

P.11. For studies conducted in Kentucky:

Field Supervisor
Frankfort Field Office
J C Watts Federal Bldg., Rm 265
330 West Broadway
Frankfort, KY 40601-8670
(502) 695-0468

P.12. For studies conducted in Louisiana:

Field Supervisor
Louisiana Ecological Services
646 Cajundome Blvd., Suite 400
Lafayette, La. 70506
Phone 337.291.3100
Fax 337.291.3139

P. 13. For studies conducted in Maine:

Field Supervisors
Maine Field Office
U.S. Fish and Wildlife Service
17 Godfrey Drive, Suite 2
Orono, ME 04473
Phone: 207-866-3344

P.14. For studies conducted in Maryland:

Field Supervisor
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401
(410) 573-4573

P.15. For studies conducted in Mississippi:

Field Supervisor
Mississippi Field Office
6578 Dogwood View Pkwy, Ste A
Jackson, MS 39213-7856
(601) 321-1122

P.16. For studies conducted in Missouri:

P.16.a.
Field Supervisor
U.S. Fish and Wildlife Service
Missouri Ecological Services Field Office
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203-2132
(573/234-2132; fax 573/234-2181)

P.16.b.
Scientific Collecting Permit Coordinator
Missouri Department of Conservation
Endangered Species and Natural History Division
2901 W. Truman Blvd., P.O. Box 180
Jefferson City, Missouri 65102-0180
(573/522-4115 ext. 3322; fax 573/751-4864)

P.17. For studies conducted in Montana:

Project Leader
585 Shepard Way
Helena, Montana 59601
Telephone: 406-449-5225
Fax: 406-449-5339

P.18. For studies conducted in Nebraska:

Assistant Field Supervisor
9325 South Alda Road
Wood River, NE 68883
Fax:(308) 384-8835
Phone: (308) 382-6468

P.19. For studies conducted in New Jersey:

Field Supervisor
New Jersey Field Office
927 N. Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

P.20. For studies conducted in New York:

Field Supervisor
New York Field Office
3817 Luker Road
Cortland, NY 13045
(607) 753-9334

P.21. For studies conducted in North Carolina:

Field Supervisor
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801-1082
(828) 258-3939

P.22. For studies conducted in North Dakota:

North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926
Phone: (701) 250-4481
Fax: (701) 355-8513

P.23. For studies conducted in Ohio:

P.23.a.
Endangered Species Coordinator for Ohio
U.S. Fish and Wildlife Service
Ohio Ecological Services Field Office
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614/416-8993, x22; fax 614/416-8994)

P.23.b.
Endangered Species Coordinator
Ohio Department of Natural Resources
Division of Wildlife
2045 Morse Road, Building G
Columbus, Ohio 43229-6693
(614-265-6329; fax 614/262-1143)

P.24. For studies conducted in Oklahoma:

P.24.a.
Field Supervisor
Oklahoma Field Office
U.S. Fish and Wildlife Service
9014 E. 21st St.
Tulsa, Oklahoma 74129-1428
(918) 382-4501

P.24.b.
Todd Fagin
Oklahoma Natural Heritage Inventory
111 E. Chesapeake St.
Norman, OK 73019
405 325-4700 (Direct Line)
405 325-4042 (Oklahoma Biological Survey main office)
405 325-7702 (Fax)
tfagin@ou.edu <mailto:tfagin@ou.edu>

P.24.c.
Oklahoma Department of Wildlife Conservation
Wildlife Division
1801 N. Lincoln Blvd.
Oklahoma City, Oklahoma 73105
405/990-7259; fax 405/521-4706

P.25. For studies conducted in Pennsylvania:

Field Supervisor
Pennsylvania Field Office
315 So. Allen Street, Suite 322
State College, PA 16801-4850
(814) 234-4090

P.25. For studies conducted in South Carolina:

P.25.a.
South Carolina Field Office
Thomas McCoy, Acting Field Supervisor
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707 x227

P.25.b.
Mary Bunch
Biologist/Preserve Manager
South Carolina Department of Natural Resources
311 Natural Resources Drive
Clemson, SC 29631
(864) 654-6738 x15
Fax: (864) 654-9168

P.26. For studies conducted in South Dakota:

South Dakota Ecological Services Field Office
420 S. Garfield Avenue,
Suite 400
Pierre, SD 57501-5408
Phone (605) 224-8693
FAX 605-224-9974

P.27. For studies conducted in Tennessee:

P.27.a.
Field Supervisor
Cookeville Field Office
U.S. Fish and Wildlife Service
446 Neal Street
Cookeville, TN 38501-4027
(931) 528-6481

P.27.b.
Brian Flock
Bat Coordinator
Tennessee Wildlife Resources Agency
P.O. Box 40747
Nashville, TN 37204

(615) 781-6569

P.28. For studies conducted in Virginia:

Field Supervisor
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061
(804) 693-6694

P.29. For studies conducted in West Virginia:

Field Supervisor
West Virginia Field Office
694 Beverly Pike
Elkins, WV 26241
(304) 636-6586

P.30. For studies conducted in Wisconsin:

P.30.a.
Phil Delphey
Endangered Species Coordinator for Wisconsin
U.S. Fish and Wildlife Service
Ecological Services Field Office
4101 American Blvd E.
Bloomington, Minnesota 55425
(612/725-3548 x2206; fax 612/725-3609)

P..30.b.
Owen Boyle
Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, Wisconsin 53707-7921
(608/266-5244)
Owen.Boyle@wisconsin.gov <mailto:Owen.Boyle@wisconsin.gov>

P.31. For studies conducted in Wyoming:

Ecological Services Wyoming Field Office
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009
Tel: (307) 772-2374
Fax: (307)772-2358

END

From:	Hamrick, Elizabeth Burton
To:	"Robbie Sykes (robbie_sykes@fws.gov)"; "Ross Shaw"
Subject:	RE: CUF CCR EIS - Notification in accordance with TVA Programmatic Consultation for Routine Actions and Federally listed bats
Date:	Tuesday, October 23, 2018 3:32:32 PM
Attachments:	image001.png image002.png image003.png image004.png image005.png image006.png image007.png image008.png Completed_412394_SilconRanch_Innovation_Solar_TVA-Bat-Strategy_10.15.201....pdf

---

Good afternoon,

TVA's programmatic ESA consultation on routine actions and bats was completed in April 2018.

For projects with NLAA or LAA determinations, TVA will be providing project-specific notification to relevant Ecological Service Field Offices. This notification also will be stored in the project administrative record. For projects that utilize Take issued through the Biological Opinion, that Take will be tracked and reported in TVA's annual report to the USFWS in March of the following year.

The attached form is serving at TVA's mechanism to determine if project-specific activities are within the scope of TVA's bat programmatic consultation and if there is project-specific potential for impact to covered bat species, necessitating conservation measures, which are identified for the project on pages 6-11. The form also is serving as the primary means of notification to the USFWS and others as needed.

Project: Silicon Ranch Innovation Solar Photovoltaic Facility, Shelby County, Tennessee. Removal of 38.6 acres of potentially suitable summer roosting habitat from November 15 - March 31. Potential impacts to wetlands. No impacts to caves. Jackson Group performed Presence/Absence surveys in accordance with the 2018 Indiana Bat Summer Survey Guidelines and did not catch any bats.

Thank you,

Liz Hamrick
Terrestrial Zoologist
Biological Compliance

400 W Summit Hill Dr. WT 11C-K
Knoxville, TN 37902

865-632-4011 (w)
ecburton@tva.gov

Project Screening Form - TVA Bat Strategy *(05/08/2018)*

This form is to assist in determining alignment of proposed projects and any required measures to comply with TVA's ESA Section 7 programmatic consultation for routine actions and federally-listed bats[1]

Project Name: DSS 2009 - SR Innovation Solar Photovoltaic Facility **Date**: 10/15/2018

Contact(s): Renewables - Dawna Aragon, NEPA - Doug W **CEC#**: _____ **RLR#:** _____ **Project ID**: 2018-29

Project Location (City, County, State): Shelby County, Tennessee

Project Description: Enter into a 20 year PPA with SR Innovation to construct and operate a 2 MW solar facility on a 45 acre project site. A total of 38.6 acres of forested lands would be cleared and graded by the project. The solar facility would be constructed on 11.2 acres while the remaining area would be maintained as grasses. TVA NEPA review is within EA 2017-11.

STEP 1) Select Appropriate TVA Action (or check here □ if none of the Actions below are applicable):

☐	**1**	Manage Biological Resources for Biodiversity and Public Use on TVA Reservoir Lands	☐	**6**	Maintain Existing Electric Transmission Assets
☐	**2**	Protect Cultural Resources on TVA-Retained Land	☐	**7**	Convey Property associated with Electric Transmission
☐	**3**	Manage Land Use and Disposal of TVA-Retained Land	☐	**8**	Expand or Construct New Electric Transmission Assets
☐	**4**	Manage Permitting under Section 26a of the TVA Act	☐	**9**	Promote Economic Development
☐	**5**	Operate, Maintain, Retire, Expand, Construct Power Plants	☑	**10**	Promote Mid-Scale Solar Generation

STEP 2) Select **all** activities from **Tables 1 and 2** (Column 1 only) included in proposed project. If you have an activity that is not listed below, describe here): _____

Table 1. Activities (CHECK ALL THAT APPLY) with No Effect on Federally Listed Bats. If none, check here: ■

	#	ACTIVITY		#	ACTIVITY
□	**1**	Loans and/or grant awards	□	**12**	Sufferance agreement
□	**2**	Purchase of property	□	**13**	Engineering or environmental planning or studies
□	**3**	Purchase of equipment for industrial facilities	□	**14**	Harbor limits
□	**4**	Environmental education	□	**19**	Site-specific enhancements in streams and reservoirs for aquatic animals
□	**5**	Transfer of ROW easement or ROW equipment	□	**20**	Nesting platforms
□	**6**	Property and/or equipment transfer	□	**41**	Minor water-based structures
□	**7**	Easement on TVA property	□	**42**	Internal renovation or internal expansion of existing facility
□	**8**	Sale of TVA property	□	**43**	Replacement or removal of TL poles, or cutting of poles to 4-6 ft above ground
□	**9**	Lease of TVA property	□	**44**	Conductor and OHGW installation and replacement
□	**10**	Deed modification of TVA rights or TVA property	□	**49**	Non-navigable houseboats
□	**11**	Abandonment of TVA retained rights			

Table 2. Activities (CHECK ALL THAT APPLY) and Associated Conservation Measures. If none, check here: □

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
□	**15**	Windshield or ground surveys for archaeological resources	□ a. NV1 □ b. HP2	□ b. HP1
□	**16**	Drilling	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3 □ g. L1, L2	□ a NV3, NV4 / □ a1. NV2
■	**17**	Mechanical vegetation removal; does not include removal of trees or tree branches ≥ 3" in diameter.	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC4, SSPC7
■	**18**	Erosion control – minor	■ a. NV1 ■ f. SPCC1, SSPC2, SSPC3, SSPC5	None
□	**21**	Herbicide use	□ d. SSPC1, SSPC2, SSPC3, SSPC5	□ d. SSPC6, SSPC7
■	**22**	Grubbing	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC4
□	**23**	Prescribed burns, burn piles, or	□ c. SHF1, SHF4, SHF5	□ c. SHF2, SHF3, SHF6, SHF7,

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
		brush piles		SHF8, SHF9
□	**24**	Tree planting	□ a. NV1 □ f. SSCP1, SSPC2, SSPC3, SSPC5	None
□	**25**	Maintenance, improvement or construction of pedestrian or vehicular access corridors	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ a1. NV2 □ f. SSPC7
□	**26**	Maintenance or construction of access control measures	□ a. NV1 □ b. HP2 □ f. SSPC1, SSPC2, SSPC3,SSPC5 □ g. L1, L2	□ a NV3, NV4 / □ a1. NV2 □ b. HP1 □ f. SSPC7
□	**27**	Restoration of sites following human use and abuse	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC7
□	**28**	Removal of debris (e.g., dump sites, hazardous material, unauthorized structures)	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC7
□	**29**	Acquisition and use of fill/borrow material	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC7
□	**30**	Dredging and excavation; recessed harbor areas	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	**31**	Stream/wetland crossings	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC7
□	**32**	Clean-up following storm damage	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC4, SSPC7
□	**33**	Removal of hazardous trees or tree branches	□ a. NV1 □ d. TR7, TR8 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ d. TR1, TR2, TR3, TR4, TR5, TR6, TR9, □ f. SSPC4, SSPC7
■	**34**	Mechanical vegetation removal, includes trees or tree branches three inches or greater in diameter	■ a. NV1 □ d. TR7, TR8 ■ f. SSPC1, SSPC2, SSPC3, SSPC5	■ d. TR1, TR2, TR3, TR4, TR5, TR6, TR9, □ f. SSPC4, SSPC7
□	**35**	Stabilization (major erosion control)	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC4, SSPC7
■	**36**	Grading	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, SSPC5 □ g. L1, L2	□ f. SSPC4, SSPC7
□	**37**	Installation of soil improvements	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3 □ g. L1, L2	□ a1. NV2 □ f. SSPC7
□	**38**	Drainage installations (including for ponds)	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3 □ g. L1, L2	□ f. SSPC7
□	**39**	Berm development	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, □ g. L1, L2	None
□	**40**	Closed loop heat exchangers (heat pumps)	□ f. SSPC5	None
□	**45**	Stream monitoring equipment-placement, use	□ a. NV1	None
□	**46**	Floating boat slips within approved harbor limits	□ f. SSPC5	None
□	**47**	Conduit installation	□ a. NV1	□ a1. NV2
■	**48**	Laydown areas	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, □ g. L1, L2	None
□	**50**	Minor land-based structures	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5 □ g. L1, L2	None
□	**51**	Signage installation	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	None
□	**52**	Floating buildings	□ a. NV1 □ f. SSPC2, SSPC3,SSPC5 □ g. L1, L2	□ a1. NV2
□	**53**	Mooring buoys or posts	□ a. NV1	

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
			□ f. SSPC2, SSPC3, SSPC5	None
□	54	Maintenance of water control structures (dewatering units, spillways, levees)	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ f. SSPC6, SSPC7
■	55	Solar panels	■ a. NV1 ■ f. SSPC2, SSPC3, SSPC5	□ f. SSPC7
□	56	Culverts	□ a. NV1 □ f. SSPC1, SSPC3, SSPC5	None
□	57	Water intake - non-industrial	□ a. NV1 □ f. SSPC3, SSPC5	None
□	58	Wastewater outfalls	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	59	Marine fueling facilities	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5 □ g. L1, L2	None
□	60	Commercial water-use facilities (e.g., marinas)	□ a. NV1 □ f. SSPC2, SSPC5 □ g. L1, L2	None
□	61	Septic fields	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	None
□	62	Blasting	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, □ g. L1, L2	□ a NV3, NV4 / □ a1. NV2
□	63	Foundation installation	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ a1. NV2
□	64	Installation of steel structure, overhead bus, equipment, etc.	□ a. NV1 □ g. SSPC1, SSPC2, SSPC3	□ a1. NV2
□	65	Pole and/or tower installation and/or extension	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ a1. NV2
□	66	Private, residential docks, piers, boathouses	□ a. NV1 □ f. SPCC5 □ g. L1, L2	None
□	67	Siting of temporary office trailers	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5 □ g. L1, L2	None
□	68	Financing for speculative building construction	□ a. NV1 □ f. SSPC5	None
□	69	Renovation of existing structures	□ a. NV1 □ f. SSPC1, SSPC3, SSPC5 □ g. L1, L2	□ e. AR1, AR2, AR4, AR5
□	70	Lock maintenance and construction	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ a1. NV2
□	71	Concrete dam modification	□ a. NV1 □ f. SSPC2, SSPC3	□ a1. NV2
□	72	Ferry landings/service operations	□ a. NV1 □ f. SSPC5 □ g. L1, L2	None
□	73	Boat launching ramps	□ a. NV1 □ f. SSPC2, SSPC5	□ a1. NV2
□	74	Recreational vehicle campsites	□ a. NV1 □ g. SPCC5	None
■	75	Utility lines/light poles	■ a. NV1 ■ f. SPCC5 □ g. L1, L2	None
□	76	Concrete sidewalk	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	77	Construction or expansion of land-based buildings	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5 □ g. L1, L2	□ e. AR1, AR2, AR5
□	78	Wastewater treatment plants	□ a. NV1 □ f. SSPC2, SSPC5 □ g. L1, L2	□ a1. NV2
□	79	Swimming pools and associated	□ a. NV1	

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
		equipment	□ f. SSPC5 □ g. L1, L2	None
□	**80**	Barge fleeting areas	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ a1. NV2
□	**81**	Water intakes - Industrial	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	**82**	Construction of dam/weirs/ Levees	□ a. NV1 □ f. SPCC2, SPCC3, SPCC5	□ a1. NV2
□	**83**	Submarine pipeline, directional boring operations	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ a1. NV2
□	**84**	On-site/off-site public utility relocation or construction or extension	□ a. NV1 □ f. SSPC1, SSPC3, SSPC5	None
□	**85**	Playground equipment - land-based	□ a. NV1 □ f. SSPC5	None
□	**86**	Landfill construction	□ a. NV1 □ f. SSPC2, SSPC3 □ g. L1, L2	□ a1. NV2
□	**87**	Aboveground storage tanks	□ a. NNV1 □ f. SSPC2, SSPC3, SSPC5	None
□	**88**	Underground storage tanks (USTs)	□ a. NV1 □ g. SSPC2, SSPC3, SSPC5	None
□	**89**	Structure demolition	□ f. SSPC1, SSPC2, SSPC3	□ e. AR1, AR2, AR4, AR5
□	**90**	Pond closure	□ a. NV1 □ f. SSPC2, SSPC3	None
□	**91**	Bridge replacement	□ a. NV1 □ f. SSPC3, SSPC5	□ a1. NV2 □ e. AR1, AR2, AR3, AR5,
□	**92**	Return of remains to former burial sites	□ a. NV1 □ b. HP2	□ b. HP1
□	**93**	Standard license	□ a. NV1 □ f. SSPC5	None
□	**94**	Special use license	□ a. NV1	None
□	**95**	Recreation license	□ a. NV1 □ f. SSPC5	None
□	**96**	Land use permit	□ a. NV1 □ f. SSPC5	None

STEP 3) Are all project activities limited to Table 1? If **YES**, **STOP HERE**. No Bat Strategy Conservation Measures required. Include this form in environmental documentation (e.g., attach to CEC) and send to batstrategy@tva.gov. If **NO**, proceed to Step 4.....□ **YES** □ **NO**

STEP 4) Check ALL relevant characteristics below. If **none** apply, **STOP HERE** and check ☐. No Bat Strategy Conservation Measures required. Include form in environmental documentation and send to batstrategy@tva.gov

■ **a**. Project may occur outside, involves human presence, or use of equipment that **generates noise or vibration** (e.g., drilling, blasting, loud machinery).

□ **a1.** Project involves continuous noise (i.e., ≥ 24 hrs) that is >75 decibels measured on A scale (e.g., loud machinery).

□ **b**. Project may involve **human entry into/survey of a potential bat roost** (cave, bridge, other structure).

□ **c**. Project may involve **fire (e.g., prescribed fire, burn piles) or preparation of fire breaks** within 0.25 mi of trees, caves, or water sources. **If prescribed burn**, estimated acreage: _____

■ **d**. Project may involve **tree removal.**
Tree removal may need to occur **outside of winter**.....☐ **YES** ☑ **NO**
Tree removal will occur **only in winter**.....☑ **YES** ☐ **NO**

Estimated number of trees or acres to be removed: 38.6 ■ acres □ trees
If warranted, project has flexibility for bat surveys (May 15-Aug 15):.....□ **MAYBE** □ **YES** □ **NO**

□ **e**. Project may involve **alteration or removal of bridges or other human structures**.

■ **f**. Project may involve land use activities involving **ground disturbance or use of chemicals or fuels** near water sources, wetlands, sinkholes, caves, or exposed limestone/karst.

□ g. Project may involve use of artifical lighting at night.

STEP 5) *Please contact Holly LeGrand or other Bat Strategy support staff for assistance if needed*. For those Activities selected in Table 2: select all Conservation Measures with letters (e.g., a-g) that correspond to characteristics selected in Step 4. If this results in selection of Conservation Measures in the last column of Table 2, a review by a terrestrial zoologist is required. Based on selection of Conservation Measures, does project require review by a terrestrial zoologist? If **YES**, **STOP HERE** and submit form as part of environmental review request; if **NO**, skip to **STEP 16**.....□ **YES** □ **NO**

Terrestrial Zoologist SME Verification (Steps 6-11 will be completed by a terrestrial zoologist if warranted):

STEP 6) Project is within range of: ☐ Gray bat ☐ VA Big-eared bat ☑ Indiana bat ☑ Northern long-eared bat

STEP 7a) Project includes the following:

- □ Removal/burning of suitable trees within 0.5 mile (0.8 km) of P1-P2 Indiana bat hibernacula or 0.25 mile (0.4 km) of P3-P4 Indiana bat hibernacula or any northern long-eared bat hibernacula.
- □ Removal/burning of suitable trees within 10 miles of documented Indiana bat hibernacula or within 5 miles of northern long-eared bat hibernacula.
- ■ Removal/burning of suitable trees greater than 10 miles from documented Indiana bat hibernacula or greater than 5 miles from documented northern long-eared bat hibernacula.
- □ Removal/burning of trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity roost tree.
- □ Removal/burning of suitable trees within 2.5 miles of Indiana bat roost trees or within 5 miles of Indiana bat capture sites.
- ■ Removal/burning of suitable trees greater than 2.5 miles from Indiana bat roost trees or greater than 5 miles from Indiana bat capture sites.
- □ Removal/burning of documented Indiana bat or northern long-eared bat roost tree, if still suitable.

STEP 7b) Amount of SUITABLE tree/acreage removal or burned (may be different than total amount of removal): 38.6 ■ acres □ trees

STEP 8) Select anticipated date range of burning/tree removal in table below:

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	□ Oct 15 - Nov 14	■ Nov 15 - Mar 31	□ Apr 1 - May 31, Aug 1- Oct 14	□ Jun 1 - Jul 31
VA	□ Sep 16 - Nov 15	□ Nov 16 - Apr 14	□ Apr 15 - Sep 15	□ Jun 1 - Jul 31
AL	□ Oct 15 - Nov 14	□ Nov 15 - Mar 15	□ Mar 16 - May 31, Aug 1 - Oct 14	□ Jun 1 - Jul 31
NC	□ Oct 15 - Nov 14	□ Nov 15 - Apr 15	□ Apr 16 - May 31, Aug 1 - Oct 14	□ Jun 1 - Jul 31
MS	□ Oct 1 - Nov 14	□ Nov 15 - Apr 14	□ Apr 15 - Sep 30	□ Jun 1 - Jul 31

STEP 9) Presence/absence surveys (visual, mist net, acoustic) were/will be conducted: □ **YES** □ **NO** □ **TBD**

STEP 10) Result of presence/absence surveys (if conducted), on 5/22-24/2018 (date): ■ **NEGATIVE** □ **POSITIVE** □ **N/A** *NOTES*: No bats captured by Jackson Group.

STEP 11) ■ Conservation measures have been verified (and modified, if necessary) in Table 2. *NOTES*:

Bat Strategy Compliance Verification (Steps 12-15 will be completed by SME/Bat Strategy Support staff):

STEP 12) Project □ **WILL** ■ **WILL NOT** require use of Incidental Take in the amount of _____ □ acres or □ trees, proposed to be used during the □ **WINTER** □ **VOLANT** □ **NON-VOLANT** bat season (or ■ **N/A**).

STEP 13) Available Incidental Take as of _____ for _____(Action):

TVA Action	Total 20-year acreage	Winter Burning/Removal	Volant Season Burning/Removal	Non-Volant Season Burning/Removal

STEP 14) Amount contributed to TVA's Bat Conservation Fund upon activity completion: _____or ■ **N/A**

STEP 15) Project Effects Determinations: ***Gray Bat***:☐NE ☐NLAA ☑N/A;***Virginia Big-eared Bat***:☐NE ☐NLAA ☑N/A ***Northern Long-eared Bat***: ☐NE ☑NLAA ☐LAA ☐N/A; ***Indiana Bat***: ☐NE ☑NLAA ☐LAA ☐N/A

NOTES: No bats captured during presence/absence surveys. Watersources may be impacted. No caves impacted.

TVA's ESA Section 7 Bat Strategy Conservation Measures Required for:

STEP 16) Based on completion of Step 5, select the appropriate Conservation Measures listed in the table below (this will be completed/verified by a Terrestrial Zoologist if a Terrestrial Zoologist review is required) and review the following bullets. Save this form in project environmental documentation AND send a copy of form to batstrategy@tva.gov. Submission of this form is an indication that the Project Lead Dawna Aragon (name) is (or will be made) aware of the requirements below.

- Implementation of conservation measures identified below is required to comply with TVA's programmatic Endangered Species Act bat consultation.

- Confirmation of completion (e.g., report from contractor, time stamped photos pre and post completion) for Conservation Measures below with an * (as well as any additional confirmation noted here by Terrestrial Zoologist: Elizabeth Hamrick) will be provided to TVA's Bat Strategy Compliance Officer (batstrategy@tva.gov) following completion of activit (ies).

- TVA may conduct post-project monitoring to determine if conservation measures were effective in minimizing or avoiding impacts to federally listed bats.

STEP 17) For projects that require use of Take and/or contribution to TVA's Bat Conservation Fund, please acknowledge the following statement:

□ Project Lead/Contact acknowledges that proposed project will result in use of _____ □ acres/□ trees in Incidental Take and will require _____ contribution to TVA's Conservation Fund upon completion of activity.

	Conservation Measure Acronym	Conservation Measure Description
☑	NV1	Noise will be short-term, transient, and not significantly different from urban interface or natural events (i.e., thunderstorms) that bats are frequently exposed to when present on the landscape.
☐	NV2	Drilling, blasting, or any other activity that involves continuous noise (i.e., longer than 24 hours) disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) within a 0.5 mile radius of documented winter and/or summer roosts (caves, trees, unconventional roosts) will be conducted when bats are absent from roost sites.
☐	NV3	Drilling or blasting within a 0.5 mile radius of documented cave (or unconventional) roosts will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the roost site.
☐	NV4	Drilling or blasting within 0.5 miles of a documented roost site (cave, tree, unconventional roost) that needs to occur when bats are present will first involve development of project-specific avoidance or minimization measures in coordination with the USFWS.
☐	HP1	Site-specific cases in which potential impact of human presence is heightened (e.g., conducting environmental or cultural surveys within a roost site) will be closely coordinated with staff bat biologists to avoid or minimize impacts below any potential adverse effect. Any take from these activities would be covered by TVA's Section 10 permit.
☐	HP2	Entry into roosts known to be occupied by federally listed bats will be communicated to the USFWS when impacts to bats may occur if not otherwise communicated (i.e., via annual monitoring reports per TVA's Section 10 permit). Any take from these activities would be covered by TVA's section 10 permit.
☐	SHF1	Fire breaks will be used to define and limit burn scope.
☐	SHF2	Site-specific conditions (e.g., acres burned, transport wind speed, mixing heights) will be considered to ensure smoke is limited and adequately dispersed away from caves so that smoke does not enter cave or cave-like structures.
☐	SHF3	Acreage will be divided into smaller units to keep amount of smoke at any one

		time or location to a minimum and reduce risk for smoke to enter caves.
☐	SHF4	If burns need to be conducted during April and May, when there is some potential for bats to present on the landscape and more likely to enter torpor due to colder temperatures, burns will only be conducted if the air temperature is 55° or greater, and preferably 60° or greater.
☐	SHF5	Fire breaks will be plowed immediately prior to burning, will be plowed as shallow as possible, and will be kept to minimum to minimize sediment.
☐	SHF6	Tractor-constructed fire lines will be established greater than 200 feet from cave entrances. Existing logging roads and skid trails will be used where feasible to minimize ground disturbance and generation of loose sediment.
☐	SHF7	Burning will only occur if site specific conditions (e.g. acres burned, transport wind speed, mixing heights) can be modified to ensure that smoke is adequately dispersed away from caves or cave-like structures. This applies to prescribed burns and burn piles of woody vegetation.
☐	SHF8	Brush piles will be burned a minimum of 0.25 mile from documented, known, or obvious caves or cave entrances and otherwise in the center of newly established ROW when proximity to caves on private land is unknown.
☐	SHF9	A 0.25 mile buffer of undisturbed forest will be maintained around documented or known gray bat maternity and hibernation colony sites, documented or known Virginia big-eared bat maternity, bachelor, or winter colony sites, Indiana bat hibernation sites, and northern long-eared bat hibernation sites. Prohibited activities within this buffer include cutting of overstory vegetation, construction of roads, trails or wildlife openings, and prescribed burning. Exceptions may be made for maintenance of existing roads and existing ROW, or where it is determined that the activity is compatible with species conservation and recovery (e.g., removal of invasive species).
☐	TR1*	Removal of potentially suitable summer roosting habitat during time of potential occupancy has been quantified and minimized programmatically. TVA will track and document alignment of activities that include tree removal (i.e., hazard trees, mechanical vegetation removal) with the programmatic quantitative cumulative estimate of seasonal removal of potential summer roost trees for Indiana bat and northern long-eared bat. Project will therefore communicate completion of tree removal to appropriate TVA staff.
☐	TR2	Removal of suitable summer roosting habitat within 0.5 mile of Priority 1/Priority 2 Indiana bat hibernacula, or 0.25 mile of Priority 3/Priority 4 Indiana bat hibernacula or any northern long-eared bat hibernacula will be prohibited, regardless of season, with very few exceptions (e.g., vegetation maintenance of TL ROW immediately adjacent to a known cave).
☐	TR3*	Removal of suitable summer roosting habitat within documented bat habitat (i.e., within 10 miles of documented Indiana bat hibernacula, within five miles of documented northern long-eared bat hibernacula, within 2.5 miles of documented Indiana bat summer roost trees, within five miles of Indiana bat capture sites, within one mile of documented northern long-eared bat summer roost trees, within three miles of northern long-eared bat capture sites) will be tracked, documented, and included in annual reporting. Project will therefore communicate completion of tree removal to appropriate TVA staff.
☑	TR4*	Removal of suitable summer roosting habitat within potential habitat for Indiana bat or northern long-eared bat will be tracked, documented, and included in annual reporting. Project will therefore communicate completion of tree removal to appropriate TVA staff.
☐	TR5	Removal of any trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity summer roost tree during non-winter season, range-wide pup season or swarming season (if site is within known swarming habitat), will first require a site-specific review and assessment. If pups are present in trees to be removed (determined either by mist netting and assessment of adult females, or by visual assessment of trees following evening emergence counts),

		TVA will coordinate with the USFWS to determine how to minimize impacts to pups to the extent possible. May include establishment of artificial roosts before removal of roost tree(s).
☐	TR6	Removal of a documented Indiana bat or northern long-eared bat roost tree that is still suitable and that needs to occur during non-winter season, range-wide pup season, or swarming season (if site is within known swarming habitat) will first require a site-specific review and assessment. If pups are present in trees to be removed (determined either by mist netting and assessment of adult females, or by visual assessment of trees following evening emergence counts), TVA will coordinate with USFWS to determine how to minimize impacts to pups to the extent possible. This may include establishment of artificial roosts before removal of roost tree(s).
☐	TR7	Tree removal within 100 feet of **existing transmission ROWs** will be limited to hazard trees. On or adjacent to TLs, a hazard tree is a tree that is tall enough to fall within an unsafe distance of TLs under maximum sag and blowout conditions and/or are also dead, diseased, dying, and/or leaning. Hazard tree removal includes removal of trees that 1) currently are tall enough to threaten the integrity of operation and maintenance of a TL or 2) have the ability in the future to threaten the integrity of operation and maintenance of a TL.
☐	TR8	Requests for removal of hazard trees on or adjacent to **TVA reservoir land** will be inspected by staff knowledgeable in identifying hazard trees per International Society of Arboriculture and TVA's checklist for hazard trees. Approval will be limited to trees with a defined target.
☐	TR9	If removal of suitable summer roosting habitat occurs when bats are present on the landscape, a funding contribution (based on amount of habitat removed) towards future conservation and recovery efforts for federally listed bats would be carried out. Project can consider seasonal bat presence/absence surveys (mist netting or emergence counts) that allow for positive detections without resulting in increased constraints in cost and project schedule. This will enable TVA to contribute to increased knowledge of bat presence on the landscape while continuing to carry out TVA's broad mission and responsibilities.
☐	AR1	Projects that involve structural modification or demolition of buildings, bridges, and potentially suitable box culverts, will require assessment to determine if structure has characteristics that make it a potentially suitable unconventional bat roost. If so a survey to determine if bats may be present will be conducted. Structural assessment will include: o Visual check that includes an exhaustive internal/external inspection of building to look for evidence of bats (e.g., bat droppings, roost entrance/exit holes); this can be done at any time of year, preferably when bats are active. o Where accessible and health and safety considerations allow, a survey of roof space for evidence of bats (e.g., droppings, scratch marks, staining, sightings), noting relevant characteristics of internal features that provide potential access points and roosting opportunities. Suitable characteristic may include: gaps between tiles and roof lining, access points via eaves, gaps between timbers or around mortise joints, gaps around top and gable end walls, gaps within roof walling or around tops of chimney breasts, and clean ridge beams. o Features with high-medium likelihood of harboring bats but cannot be checked visually include soffits, cavity walls, space between roof covering and roof lining. o Applies to box culverts that are at least 5 feet (1.5 meters) tall and with one or more of the following characteristics. Suitable culverts for bat day roosts have the following characteristics: ▪ Location in relatively warm areas

		▪ Between 5-10 feet (1.5-3 meters) tall and 300 ft (100 m) or more long ▪ Openings protected from high winds ▪ Not susceptible to flooding ▪ Inner areas relatively dark with roughened walls or ceilings ▪ Crevices, imperfections, or swallow nests o Bridge survey protocols will be adapted from the Programmatic Biological Opinion for the Federal Highway Administration (Appendix D of USFWS 2016c, which includes a Bridge Structure Assessment Guidance and a Bridge Structure Assessment Form). o Bat surveys usually are NOT needed in the following circumstances: ▪ Domestic garages /sheds with no enclosed roof space (with no ceiling) ▪ Modern flat-roofed buildings ▪ Metal framed and roofed buildings ▪ Buildings where roof space is regularly used (e.g., attic space converted to living space, living space open to rafters) or where all roof space is lit from skylights or windows. Large/tall roof spaces may be dark enough at apex to provide roost space.
☐	AR2	Additional bat P/A surveys (e.g., emergence counts) conducted if warranted (i.e., when AR1 indicates that bats may be present).
☐	AR3	Bridge survey protocols will be implemented, either by permittee (e.g., state DOT biologists) or qualified personnel. If a bridge is determined to be in use as an unconventional roost, subsequent protocols will be implemented.
☐	AR4	Removal of buildings with suitable roost characteristics within six miles of known or presumed occupied roosts for Virginia big-eared bat would occur between Nov 16 and Mar 31. Buildings may be removed other times of the year once a bat biologist evaluates a buildings' potential to serve as roosting habitat and determines that this species is not present and/or is not using structure(s).
☐	AR5	If evidence of bat use warrants seasonal modification or removal, TVA will carry out or recommend (i.e., to applicants) seasonal modification or removal. Risk to human safety, however, should take priority. For project-specific cases in which project is unable to accommodate seasonal modification or removal, and federally listed bat species are present, TVA will carry out or recommend consultation with the USFWS to determine the best approach in the context of the project-specific circumstance. This may include establishment of artificial roosts before demolition of structures with bats present.
☐	SSPC1	**Transmission actions and activities** will continue to Implement A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities. This focuses on control of sediment and pollutants, including herbicides. Following are key measures: o BMPs to minimize erosion and prevent/control water pollution in accordance with state-specific construction storm water permits. BMPS are designed to keep soil in place and aid in reducing risk of other pollutants reaching surface waters, wetlands and ground water. BMPs will undertake the following principles: ▪ Plan clearing, grading, and construction to minimize area and duration of soil exposure. ▪ Maintain existing vegetation wherever and whenever possible. ▪ Minimize disturbance of natural contours and drains. ▪ As much as practicable, operate on dry soils when they are least susceptible to structural damage and erosion. ▪ Limit vehicular and equipment traffic in disturbed areas. ▪ Keep equipment paths dispersed or designate single traffic flow

		paths with appropriate road BMPs to manage runoff. ▪ Divert runoff away from disturbed areas. ▪ Provide for dispersal of surface flow that carries sediment into undisturbed surface zones with high infiltration capacity and ground cover conditions. ▪ Prepare drainage ways and outlets to handle concentrated/increased runoff. ▪ Minimize length and steepness of slopes. Interrupt long slopes frequently. ▪ Keep runoff velocities low and/or check flows. ▪ Trap sediment on-site. ▪ Inspect/maintain control measures regularly and after significant rain. ▪ Re-vegetate and mulch disturbed areas as soon as practical. o Application of herbicide is in compliance with USEPA, state water quality standards, and state permits. Areas in which covered species are known to occur on existing transmission line ROW are depicted on referenced, applicable spreadsheets and include guidelines to follow for impact minimization or avoidance. During pre-job briefings, the ROW Forester will review location of resources with contractors and provide guidelines and expectations from TVA's BMP Manual (Appendix O). Herbicides labeled for aquatic use are utilized in and around wetlands, streams, and SMZs. Unless specifically labeled for aquatic use, measures are taken to keep herbicides from reaching streams whether by direct application or through runoff or flooding by surface water. Hand application of certain herbicides labeled for use within SMZs is used only selectively. o Specific guidelines regarding sensitive resources and buffer zones: ▪ Extra precaution (wider buffers) within SMZs is taken to protect stream banks and water quality for streams, springs, sinkholes, and surrounding habitat. ▪ BMPs are implemented to protect and enhance wetlands. Select use of equipment and seasonal clearing is conducted when needed for rare plants; construction activities are restricted in areas with identified rare plants. ▪ Standard requirements exist to avoid adverse impacts to caves, protected animals, and unique and important habitat (e.g., protective buffers around caves, restricted herbicide use, seasonal clearing of suitable habitat).
☑	SSPC2	Operations involving chemical/fuel storage or resupply and vehicle servicing will be handled outside of riparian zones (streamside management zones) in a manner to prevent these items from reaching a watercourse. Earthen berms or other effective means are installed to protect stream channel from direct surface runoff. Servicing will be done with care to avoid leakage, spillage, and subsequent stream, wetland, or ground water contamination. Oil waste, filters, other litter will be collected and disposed of properly. Equipment servicing and chemical/fuel storage will be limited to locations greater than 300-ft from sinkholes, fissures, or areas draining into known sinkholes, fissures, or other karst features.
☐	SSPC3	**Power Plant actions and activities** will continue to implement standard environmental practices. These include: o Best Management Practices (BMPs) in accordance with regulations:

		▪ Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy ▪ Maintain every site with well-equipped spill response kits, included in some heavy equipment ▪ Conduct Quarterly Internal Environmental Field Assessments at each sight ▪ Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant. ▪ When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage o Construction Site Protection Methods ▪ Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites ▪ Storm drain protection device ▪ Check dam to help slow down silt flow ▪ Silt fencing to reduce sediment movement o Storm Water Pollution Prevention (SWPP) Pollution Control Strategies ▪ Minimize storm water contact with disturbed soils at the construction site ▪ Protect disturbed soil areas from erosion ▪ Minimize sediment in storm water before discharge ▪ Prevent storm water contact with other pollutants ▪ Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1 acre) o Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to minimize fuel and chemical use
☐	SSPC4	Woody vegetation burn piles associated with **transmission construction** will be placed in the center of newly established ROWs to minimize wash into any nearby undocumented caves that might be on adjacent private property and thus outside the scope of field survey for confirmation. Brush piles will be burned a minimum of 0.25 miles from documented caves and otherwise in the center of newly established ROW when proximity to caves on private land is unknown.
☑	SSPC5	**Section** 26a permits and contracts associated with **solar projects**, **economic development projects** or land use projects include standards and conditions that include standard BMPs for sediment and contaminants as well as measures to avoid or minimize impacts to sensitive species or other resources consistent with applicable laws and Executive Orders.
☐	SSPC6	Herbicide use will be avoided within 200 ft of portals associated with caves, cave collapse areas, mines and sinkholes that are capable of supporting cave-associated species. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements.
☐	SSPC7	Clearing of vegetation within a 200-ft radius of documented caves will be limited to that conducted by hand or small machinery clearing only (e.g., chainsaws, bush-hog, mowers). This will protect potential recharge areas of cave streams and other karst features that are connected hydrologically to caves.
☐	L1	Direct temporary lighting away from suitable habitat during the active season.
☐	L2	Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution when installing new or replacing existing permanent lights by angling lights downward or via other light minimization measures (e.g., dimming, directed lighting, motion-sensitive lighting).

[1]Bats addressed in consultation (02/2018), which includes gray bat (listed in 1976), Indiana bat (listed in 1967), northern long-eared bat (listed in 2015), and Virginia big-eared bat (listed in 1979).

Appendix D

Cultural Resources Report Title Page

This page intentionally left blank.

A Phase I Cultural Resources Survey of a Planned 2-MW Solar Array in Memphis, Shelby County, Tennessee

Tennessee Valley Archaeological Research

Appendix E

Tennessee State Historic Preservation Office Consultation and Chickasaw Nation Concurrence

This page intentionally left blank

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

August 31, 2018

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Pike
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), SILICON RANCH 2-MW SOLAR ARRAY, SHELBY COUNTY, TENNESSEE

TVA proposes to enter into a Power Purchase Agreement with Silicon Ranch Corporation (SRC) to buy electric power generated from the proposed 2-Megawatt (MW) solar array in Memphis, Shelby County, Tennessee. TVA determined the area of potential effect (APE) to be the 49.7-acre project tract and the APE for indirect effects to be .5 mile radius within visual line sight to the project area.

The applicants contracted with Tennessee Valley Archaeological Research (TVAR) to conduct a Phase I Cultural Resources survey. Please find the resulting report titled *A Phase I Cultural Resources Survey of a Planned 2-MW Solar Array in Memphis, Shelby County, Tennessee* enclosed.

The architectural investigation resulted in the documentation of one new resource (IS-1) within the APE. Property IS-1 is a 1.3-mile segment of the Illinois Central Railroad that crosses within the architectural survey radius. Property IS-1 is a segment of an early twentieth-century railroad that has been continuously altered through routine maintenance over a 100-year period. As the result of periodic repairs, no materials associated with the original construction of the railroad remain. Based on this information, TVA finds that IS-1 is not eligible for the National Register of Historic Places (NRHP), due to loss of integrity caused by modern alterations. No archaeological resources were identified during the investigation.

Based on the identification efforts, it is TVA's finding that the proposed undertaking would have no effect on any historic properties eligible for or listed on the NRHP. Pursuant to 36 CFR Part 800.4(d)(1), TVA seeks your concurrence with these findings and determinations.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the APE that may be of religious and cultural significance and eligible for listing in the NRHP.

If you have any questions or comments, please contact Michaelyn Harle by telephone, (865) 632-2248 or by email, mharle@tva.gov.

Sincerely,

Edward W. Wells

Edward W. Wells on Behalf of Clinton E. Jones
Manager
Cultural Compliance

MSH:ABM
Enclosures
cc (Enclosures):
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

September 12, 2018

Mr. Clinton E. Jones
Tennessee Valley Authority
Biological and Cultural Compliance
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Silicon Ranch 2-MW Solar Array, Near Point Church Road, Memphis, Shelby County, TN

Dear Mr. Jones:

In response to your request, we have reviewed the cultural resources survey report and accompanying documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Considering the information provided, we concur with your agency that no historic properties eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed or archaeological remains are discovered during project construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Questions or comments may be directed to Jennifer Barnett (615) 687-4780.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

October 16, 2018

Ms. Marianne Shuler, Senior Specialist,
Archaeologist and Tribal Liaison
Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
460 WT 7D-K
Knoxville, TN 37902

Dear Ms. Shuler:

Thank you for the letters of notification of the proposed projects delineated in the attached table. We accept the invitation to consult under Section 106 of the National Historic Preservation Act.

The Chickasaw Nation supports the proposed undertakings and is not presently aware of any specific historic properties, including those of traditional religious and cultural significance, in the project areas. In the event the agency becomes aware of the need to enforce other statutes we request to be notified under ARPA, AIRFA, NEPA, NAGPRA, NHPA and Professional Standards.

Your efforts to preserve and protect significant historic properties are appreciated. If you have any questions, please contact Ms. Karen Brunso, tribal historic preservation officer, at (580) 272-1106, or at karen.brunso@chickasaw.net.

Sincerely,

Lisa John, Secretary
Department of Culture and Humanities

cc: mmshuler@tva.gov

Enclosure

Project Description	Location
Proposed Power Purchase Agreement with Silicon Ranch Corporation to buy electric power generated by the proposed solar array	Memphis, Shelby County, Tennessee
Proposed Power Purchase Agreement with Silicon Ranch Corporation to buy electric power generated by the proposed solar array	Jackson, Madison County, Tennessee