

Draft
Environmental Impact Statement
for the
Lund Hill Solar Energy Project

Prepared for:



Prepared by:



April 2019

Draft
Environmental Impact Statement
for the
Lund Hill Solar Energy Project

Prepared for
Avangrid Renewables

Prepared by
Tetra Tech

April 2019

Project Name:

Lund Hill Solar Energy Project
Draft Environmental Impact Statement

Submitted Pursuant to:

Washington State Environmental Policy Act (WAC 197-11)

Submitted by:

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Lead Agency:

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Project Abstract

Aurora Solar, LLC (Applicant), a wholly owned subsidiary of Avangrid Renewables, Inc., proposes to develop and operate the Lund Hill Solar Energy Project (Project) in unincorporated Klickitat County, south of Bickleton, Washington. The Project would consist of solar panels, electrical collector lines, inverters, transformers, and a substation, generating up to 150 megawatts of solar energy. The Project would be sited on approximately 1,871 acres, within a solar siting area of 4,513 acres consisting primarily of privately owned land. One portion of the Project area is owned by the Washington State Department of Natural Resources.

In keeping with the requirements of Revised Code of Washington 43.21C.030 (2)(c), this Draft Environmental Impact Statement (EIS) was prepared to review potential impacts on the public and environmental resources that could result from the construction and operation of the Project. Public review of the Draft EIS would occur between May 1 and May 31, 2019. Klickitat County would accept comments and questions regarding the Draft EIS during this time. These comments would be addressed in the Final EIS, which is expected to be released in June 2019. Klickitat County can issue an Energy Overlay Zone permit for the Project once it determines that the application and Project studies are substantially complete.

For further information on this Project, please contact Ms. Mo-chi Lindblad, Klickitat County Planning Director, telephone (509) 773-5703. Additional copies of this Draft EIS are available online at <https://www.klickitatcounty.org/272/Planning-Department>.

Comment Period

Comments on the Draft EIS must be in writing. The comment period for this document will extend 30 days from the date of publication, and comments must be received by May 31, 2019.

Name, Title (agency)

Date of Approval

Name, Title (agency)

Date of Approval

Name, Title (agency)

Date of Approval

Fact Sheet

Project Name:

Lund Hill Solar Energy Project

Project Description

Aurora Solar, LLC (Applicant), a wholly owned subsidiary of Avangrid Renewables, Inc., proposes to develop and operate the Lund Hill Solar Energy Project (Project) in unincorporated Klickitat County, 6.5 miles southwest of Bickleton, Washington. The Project would consist of a 150-megawatt solar energy facility adjacent to several existing wind facilities (i.e., Big Horn to the north and west, Juniper Canyon to the northeast, and White Creek and Harvest Wind to the southwest). The Project area consists of approximately 1,871 acres of private and state lands located within a 4,513-acre “solar facility siting area” within the county’s Energy Overlay Zone (EOZ).

The Project consists of solar photovoltaic modules (or panels), support structures, electrical inverters, power transformers, and conductors. Solar modules use photovoltaic cells (PV cells) to generate electricity by converting sunlight into direct current electrical energy, which is then converted to alternating current by the inverters. Energy generated by the solar modules would be transmitted through a system of 34.5-kilovolt (kV) underground and overhead lines to a collector substation that would step the voltage from 34.5 kV up to 230 kV. The substation would be connected by a new 230-kV transmission line to the existing Juniper Canyon Wind Farm 230-kV overhead transmission line. The Juniper Canyon transmission line runs through the Project area and connects into the Bonneville Power Administration Rock Creek Substation, located southwest of the Project.

The Project would either share use of the existing operations and maintenance (O&M) building at the Big Horn Wind Facility to the northwest, or would construct a new O&M building specific to the Lund Hill solar facility. If the existing Big Horn O&M building is used, the Applicant would work with the Klickitat County Road Department on potential repairs or upgrades to the county road that provides access to that facility. If a new O&M building is constructed, it could consist of a 5,000-square-foot building on a 10-acre lot adjacent to, or in close proximity, to the collector substation. Existing roads would be used to the extent practicable for Project construction and operation; however, new permanent gravel or dirt roads would be constructed to access facilities within the Project area. A chain-link or similar perimeter fencing would enclose the Project area. Up to eight locked gates would be installed along existing roadways to allow access to the facility.

This Draft EIS evaluates potential environmental impacts from two alternatives: the Build Alternative and the No Build Alternative. Under the No Build Alternative, the Project would not occur. The Project area would remain in its current state and would not generate electricity. Under the Build Alternative, the Project would be constructed. Potential impacts from the Project on land use and recreation, vegetation and wildlife, wetlands and other waters, visual and aesthetic resources, cultural resources, noise, transportation, geologic hazards, land use, air quality, public

health and safety, and public services and utilities are evaluated in this Draft EIS. The Draft EIS also addresses potential cumulative impacts from construction of this Project in addition to other existing and known planned energy projects in the area.

Lead Agency

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Document Availability

Copies can be reviewed or obtained at the Klickitat County Planning Department at the address above. A limited number of copies have been printed for free distribution. Additional printed and electronic copies of the Draft EIS are available from the Klickitat County Planning Department at cost. Field survey reports used in preparation of this EIS can be obtained from the Klickitat County Planning Department on request.

Comment Period

Comments on the Draft EIS must be in writing. The comment period for this document will extend 30 days from the date of publication, and comments must be received by May 31, 2019.

Review Comments and Contact Information

Written comments on this Draft EIS may be provided to the Klickitat County Planning Department, 228 West Main Street, MS: CH-17, Goldendale, Washington, 98620.

Public Meeting

The Applicant has conducted one informal community meeting in advance of Draft EIS preparation. The initial meeting was held from 5:30 to 7:30 p.m. on Thursday, December 13, 2018, at the Bickleton Grange Hall in Bickleton, Washington. The purpose of the meeting was to provide interested members of the community information about the Project. During the meeting, the Applicant provided a review of the application for a permit to construct and operate the Project under the County's EOZ ordinance. Landowners within and adjacent to the solar facility siting area were invited to attend. Approximately 16 people attended.

Anticipated Permits and Approvals

State permits required for this Project would include a National Pollutant Discharge Elimination System (NPDES) permit and a State Wastewater Discharge General permit to be issued by the Washington State Department of Ecology. A Spill Prevention Control and Countermeasures (SPCC) plan may be required if lubrication oil is stored on site. The Applicant has obtained a lease from the

Washington State Department of Natural Resources (WDNR) for construction of facilities on WDNR land.

Klickitat County is the lead agency for environmental review of the Project, and would be responsible for issuing approval through an EOZ permit. Klickitat County also is responsible for issuing building permits related to the Project. See Section 1.5 for more details.

Date of Issue

April 26, 2019

Decision

A final decision regarding the EOZ application is anticipated in July 2019. Project construction is anticipated over a period of approximately 9 to 12 months from commencement to commercial operation. Pending issuance of relevant permits, the Project is anticipated to start construction in 2019.

Subsequent Environmental Review

The comment period for this Draft EIS will end May 31, 2019. Comments received during the comment period will be reviewed and addressed, and incorporated into a Final EIS, which is expected to be released in June 2019.

No additional review is anticipated. The EIS adopts the Klickitat County Final EOZ EIS (September 2004, amended February 2010; Klickitat County 2004). The document assesses impacts associated with the County's EOZ, which permits solar energy projects outright.

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Acronyms and Abbreviations

AAQS	ambient air quality standards
AC	alternating current
ADT	average daily traffic
AJD	Approved Jurisdictional Determination
amsl	above mean sea level
Applicant	Aurora Solar, LLC
Avangrid	Avangrid Renewables, Inc.
BMP	best management practice
BoCC	Birds of Conservation Concern
BP	before present
BPA	Bonneville Power Administration
CAO	Critical Areas Ordinance
CFR	Code of Federal Regulations
CIGS	copper indium gallium diselenide
CRBG	Columbia River Basalt Group
CRP	Conservation Reserve Program
DAHP	Department of Archaeology and Historic Preservation
dB	decibel
dBA	A-weighted decibel
°F	degrees Fahrenheit
Ecology	Washington State Department of Ecology
EDNA	environmental designation for noise abatement
EIS	Environmental Impact Statement
EMF	electric and magnetic field
EOZ	Energy Overlay Zone
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS	geographic information system

Hz	hertz
ISO	International Organization for Standardization
kHz	kilohertz
KPUD	Klickitat Public Utility District
kV	kilovolt
Leq	equivalent sound level
LOS	level of service
LP	sound pressure level
LW	sound power level
μPa	micropascals
mm	millimeter
mph	miles per hour
MW	megawatts
NEPA	National Environmental Policy Act
NOC	notice of construction
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSR	noise sensitive receptor
NWI	National Wetlands Inventory
O&M	operations and maintenance
PaleoWest	PaleoWest Archaeology
PJD	Preliminary Jurisdictional Determination
PM ₁₀	aerodynamic radius of 10 microns or less
PM _{2.5}	aerodynamic radius of 2.5 microns or less
Project	Proposed Lund Hill Solar Energy Project
PSD	prevention of significant deterioration
RCW	Revised Code of Washington
RV	recreational vehicle
SCADA	supervisory control and data acquisition
SEPA	Washington's State Environmental Policy Act

SPCC	Spill Prevention, Control, and Countermeasures
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TAP	toxic air pollutant
tpy	tons per year
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
W	watts
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WHR	Washington Heritage Register
WISAARD	Washington Information System for Architectural and Archaeological Records Database
WNHP	Washington Natural Heritage Program
WRIA	Water Resources Inventory Area
WSDOT	Washington Department of Transportation

1.0 Summary

Aurora Solar, LLC (Applicant), a wholly owned subsidiary of Avangrid Renewables, Inc. (Avangrid), proposes to develop and operate the Lund Hill Solar Energy Project (Project) in unincorporated Klickitat County, south of Bickleton, Washington. The Project would have an output of up to 150 megawatts (MW) of electricity.

The Applicant's parent company, Avangrid Renewables, Inc., is currently a leader in renewable energy development in the United States with 6,600 MW of installed renewable energy generating capacity consisting of wind and solar energy capacity. The Project area is immediately south and west of the existing 250-MW Big Horn Wind Power Project and 151-MW Juniper Canyon Phase I Project sites, which are also owned and operated by the Applicant. The Project is being reviewed through an Environmental Impact Statement (EIS) prepared under the Washington State Environmental Policy Act (SEPA) review procedures. Klickitat County is the lead agency for the Project.

The Klickitat County Energy Overlay Zone (EOZ) permit application was submitted to Klickitat County in November 2018. The EOZ permit application included the solar energy facility described and evaluated in this EIS, along with a battery energy storage unit that was subsequently removed from the plans. The Applicant held a community meeting on December 13, 2018, at the Bickleton Grange Hall in Bickleton, Washington. The *Goldendale Sentinel* advertised the meeting on November 21 and November 28, 2018. Klickitat County emailed meeting announcements to landowners in the Project vicinity, property owners within 300 feet of the Project area, and people on Klickitat County's list of interested parties. Approximately 16 people attended the community meeting.

The following environmental studies have also been conducted in preparation for this Project:

- Rare plant and habitat studies conducted in May and June 2018
- Wetland surveys conducted in May and June 2018
- Cultural resource surveys conducted in August 2018

Formal public scoping for the Project was initiated on November 16, 2018, with announcements in the *State Environmental Policy Act Register*, the *Goldendale Sentinel*, and the *White Salmon Enterprise*. The formal public scoping period ran through December 21, 2018. Six scoping comments were received in emails from the Klickitat County Planning Department dated December 26 and December 27, 2018.

1.1 Purpose and Need

Among the requirements in Washington and Oregon renewable portfolio standards is the construction of additional capacity for renewable energy generation. The Project would help meet this need by providing up to 150 MW of clean renewable energy—enough to provide electricity to approximately 31,000 to 38,000 homes based on average energy use.

In 2004, Klickitat County issued an EIS for an EOZ in its Comprehensive Plan (Klickitat County 2004) with the purpose of facilitating energy development in optimal locations within the county. This Project would be consistent with Klickitat County's stated goals and would help to meet their identified energy generation and economic development needs.

1.2 Project Components and Schedule

The Project consists of a 150-MW solar energy facility located in Klickitat County, south of Bickleton, Washington.

The Project would include solar modules, a tracker system, and associated electrical components including cabling, wires, inverters, and transformers, all enclosed by chain-link fencing. Energy generated by the solar modules would be transmitted through a system of low-voltage wires to multiple inverters and transformers to 34.5-kilovolt (kV) underground and potentially overhead lines to a collector substation that would step the voltage from 34.5 kV up to 230 kV. The substation would be connected by a new 230-kV transmission line to the existing Juniper Canyon Wind Farm 230-kV transmission line. The Juniper Canyon transmission line runs through the northern portion of the solar facility siting area and connects into the Bonneville Power Administration Rock Creek Substation, located southwest of the Project. The Project would either use the existing Big Horn operations and maintenance (O&M) facility located nearby or construct a new O&M facility adjacent to the Project substation. If the existing Big Horn O&M facility is used, repairs to the county road that provides access to that facility could be required through an agreement with Klickitat County. If required, these upgrades may be executed by the County, or by Avangrid during construction of the Project.

It is expected that Project construction would occur over a period of approximately 9 to 12 months from commencement to commercial operation. The Project would begin construction in 2019. The Project construction schedule showing the major tasks and key milestones is provided in Table 1-1.

Table 1-1. Estimated Project Construction Schedule

Task/Milestone	Start	Finish
EOZ Permit Approval		July 2019
Project Construction		
Road Construction	December 2019	February 2020
Tracker Support Installation	February 2020	June 2020
Install Trackers and Panels	March 2020	August 2020
Electrical System Installation	February 2020	September 2020
Energize and Commission Plant	September 2020	December 2020

1.3 Major Conclusions

The potential environmental effects of the Project have been documented in this EIS under the Washington SEPA review procedures. The Project is located entirely within Klickitat County's EOZ

and is consistent with the guidelines set forth in their Energy Overlay Final Environmental Impact Statement (Klickitat County 2004).

Visual impacts would result primarily from visibility of the solar modules that could extend up to 16 feet above ground level at maximum tilt (depending on final racking solution and panel orientation). Views of the solar modules from local roads are limited primarily to drivers along Middle Road and Schrantz Road, as well as to residents on Middle Road. The Project would appear as a subordinate feature at most of the analysis viewpoints.

Vegetation would be temporarily and permanently disturbed during Project construction and operation. Indirect effects would be minimized, and no direct effects to special-status plant species are expected. Displacement of wildlife could occur, and therefore, competition could increase among species near the Project. Impacts to vegetation and habitat would be minimized to the extent possible, and areas that are disturbed during construction would be replanted. The Project would avoid impacts to wetlands and waterways.

1.4 Mitigation Measures

This EIS describes avoidance, minimization, and mitigation measures for many of the resources analyzed. For example, impacts to wetlands and streams will be avoided by siting facilities outside of delineated features. Also, the Project would be required to comply with applicable regulations including stormwater management and handling of waste materials. Mitigation measures to minimize impacts on visual features include painting buildings a neutral color, reseeding areas disturbed during the construction process, and using anti-reflective coatings on solar panels to reduce the level of reflectivity. To minimize impacts on vegetation and wildlife, mitigation measures would include implementation of a restoration and weed management program, flagging of sensitive resources for avoidance during construction, implementation of a fire control plan, implementation of an erosion and sediment control plan, and conducting vegetation removal outside of the nesting season or conducting surveys to identify and avoid nests during the nesting season.

1.5 Review and Approval Process

Klickitat County will review the Project under the EOZ standards (Klickitat County Zoning Code Section 2.30), enacted under Klickitat County Ordinance #0031515 in 2005 and subsequently revised in 2010 (Ordinance #0081710) and 2011 (Ordinance #005311). This Draft EIS has been prepared to address compliance with Klickitat County's Energy Overlay Zoning Code as well as the Klickitat County Critical Areas Ordinance and the requirements of Washington's SEPA.

A 30-day public review period for this Draft EIS would begin on the day the document is announced in the *Goldendale Sentinel*. The announcement is anticipated to appear on May 1, 2019. During this review period, Klickitat County would accept comments and questions concerning the Draft EIS. These comments would be addressed in the Final EIS, which is expected to be released in June 2019. Klickitat County can issue an EOZ permit for the Project once it determines that the application and Project studies are substantially complete.

The following additional studies and permits may also be required for this Project:

- Record of Decision from Bonneville Power Administration addressing National Environmental Policy Act (NEPA) compliance for Project interconnection at Rock Creek Substation
- Archaeological permit Washington Administrative Code (WAC) 25-48 prior to ground-disturbing activities from Washington Department of Archaeology and Historic Preservation
- Critical areas ordinance review from the Klickitat County Planning Department
- Building permits from the Klickitat County Building Department before site development and construction activities begin
- County road access permit, right-of-way permits, road-haul agreement for restoration from Klickitat County Public Works Department
- Approved septic plan from the Klickitat County Health Department
- Electrical Permit and Inspection, issued and conducted by the Washington State Department of Labor and Industries
- Washington State Department of Ecology (Ecology) National Pollutant Discharge Elimination System (NPDES) Permit for stormwater discharges associated with construction activities
- Stormwater Pollution Prevention Plan (SWPPP) for a construction stormwater general permit
- Temporary water right (construction water) from Ecology
- Spill Prevention, Control, and Countermeasures (SPCC) plan for compliance with WAC 173-180 and 181 during project operation
- Portable Rock Crusher General Order of Approval from Ecology for construction activities

2.0 Alternatives Considered

Two alternatives are being considered in this EIS: a No Build Alternative and a Build Alternative.

2.1 No Build Alternative

Under the No Build Alternative, the Project would not occur. The Project area would remain in its current state and would not generate solar energy.

2.2 Build Alternative

The Project would construct and operate a 150-MW solar energy facility within Klickitat County, Washington, adjacent to several existing wind facilities (i.e., Big Horn to the north and west; Juniper Canyon to the northeast; and White Creek and Harvest Wind to the southwest). The Project area consists of approximately 1,871 acres of private and state lands located within a 4,513-acre “solar facility siting” area within the county’s EOZ (Figure 2-1; all figures in this EIS are located in the Figures section located after the main text and before the appendices).

The Project consists of solar PV modules (or panels), support structures, electrical inverters, and power transformers. Solar modules use cells to generate electricity by converting sunlight into direct current electrical energy, which is then converted to alternating current by the inverters. Energy generated by the solar modules would be transmitted through a system of 34.5-kV underground and potentially overhead lines to a collector substation that would step the voltage from 34.5 kV up to 230 kV. The substation would be connected by a new 230-kV transmission line to the existing Juniper Canyon Wind Farm 230-kV transmission line. The Juniper Canyon transmission line runs through the Project area and feeds into the Bonneville Power Administration (BPA) Rock Creek Substation, located southwest of the Project (Figure 2-1).

The Project would either use the existing O&M building at the Big Horn Wind Facility to the north through a shared facilities agreement or would construct a new O&M building specific to the Lund Hill solar facility. If the existing Big Horn O&M building is used, the applicant would work with the Klickitat County Road Department on potential repairs or upgrades to the county road that provides access to that facility. If a new O&M building is constructed, it would consist of a 5,000-square-foot building on a 10-acre lot adjacent to the collector substation. Existing roads would be used to the extent practicable for Project construction and operation; however, new permanent gravel roads would be constructed to access facilities within the Project area. Chain-link perimeter fencing would enclose the Project area. Up to eight locked gates would be installed along existing roadways to allow access to the facility.

The 1,871-acre Project area is a subset of the approximately 4,513-acre solar facility siting area, within which the applicant has proposed a general layout for the purpose of analyzing potential resource impacts (Figure 2-2). The assumptions included in this general layout are intended to provide a potential worst-case scenario to assess potential Project environmental impacts under SEPA. Final Project layout would depend on the available technology, installation techniques, and

topography, as well as environmental resource considerations. This layout was selected for analysis because it is a likely location within the solar facility siting area and because it depicts the greatest potential impacts to most resources. However, during final design, the solar array could be shifted farther from the Juniper Canyon transmission line to reduce potential resource impacts and optimize power generation. As such, all numbers in this EIS are considered preliminary and may change after further engineering. The Project would be designed to avoid, reduce, or mitigate impacts as appropriate through micrositing, as well as implement best management practices (BMPs) and mitigation measures. Construction of the Project would last approximately 9 to 12 months, with an anticipated operational lifespan of up to 50 years.

2.2.1 Overview of Project Facilities

The proposed Project would consist of a solar array along with supporting facilities located within the Project area, as follows:

- Solar modules and racking system.
- Low-voltage cabling that would connect the solar strings to inverters to convert panel output from direct current to alternating current. Additional cabling would connect the inverters to transformers that would step up the voltage to 34.5 kV for the collector cable lines.
- A 34.5-kV collector cable system linking the solar inverters and transformers to each other and ultimately to the collection substation. The collector cable system would be underground as much as possible; however, it would be constructed overhead for portions where necessary to avoid sensitive environmental areas such as streams and wetlands, and to minimize ground disturbance when spanning topographical features.
- A 5-acre collector substation power transformer to step up the voltage from 34.5 kV to 230 kV for transmission.
- An overhead 230-kV interconnection from the collector substation to the existing Juniper Canyon 230-kV transmission line that delivers power to the BPA Rock Creek Substation.
- An O&M building (up to 5,000 square feet), parking, and laydown areas constructed on a 10-acre site.
- Permanent, unpaved access roads within the Project area that would provide access along the perimeter of the Project area, in between solar strings, to the collector substation, and to the O&M building.
- A Project area perimeter fence. The fencing would be either 6 feet tall with an additional foot of barbed wire along the top or 8 feet tall without barbed wire, depending on wildlife resource considerations.

2.2.2 Solar Array (photovoltaic solar generation)

The solar array would consist of the solar modules, tracker systems, and connecting electrical equipment. A range of technology is proposed to preserve design flexibility and accommodate rapidly changing technology. These components are discussed in more detail below.

2.2.2.1 Solar Modules

The Project would consist of solar modules and racking system. The ultimate decision for the module types and racking systems would depend on market conditions, availability, and environmental factors, including the recycling potential of the modules at the end of their useful lives. Types of modules that may be installed include thin-film modules (including cadmium telluride [CdTe or “cad tel”] and copper indium gallium diselenide [CIGS] technologies), poly or mono crystalline silicon modules, or any other commercially available PV technology. Solar thermal technology is not being considered. Module mounting systems that may be installed include either fixed-tilt or tracking technology, depending on the PV modules ultimately selected. Multiple types of modules and racking systems may be installed across the site. Example solar modules and tracker components are shown on Figures 2-3 and 2-4. Once operational, solar modules require minimal maintenance. Solar panel manufacturers currently do not recommend routine washing of panels; however, periodic washing may be needed to optimize performance. If needed during operations, the solar modules could be washed several times per year. For panel washing and other uses, many solar facilities use up to 16,250 gallons of water per MW per year. If panels at the Lund Hill facility are washed, this could total up to approximately 2.5 million gallons of water per year. Water would be sourced from legally permitted water resources either in the vicinity or offsite and transported to the site as needed.

2.2.2.2 Solar Tracker System

Each tracker would be supported by multiple steel posts, which could be round hollow posts or pile-type posts (e.g., H-pile, C-pile, S-pile). Post depth may vary depending on soil conditions but are typically installed 4 to 10 feet below the surface and protrude approximately 4 to 5.5 feet above grade. Posts at the end of the tracker rows are usually installed at a greater depth to help them withstand wind uplift. Impact pile driving or vibratory pile driving with a pre-drill may be required to install the posts. If concrete is required, approximately 0.3 cubic yard of concrete would be required per post, for an estimated 21,500 cubic yards of concrete. Post locations would be determined by the final layout of the tracker system and geotechnical investigations of the Project area. If blasting is required, a detailed blasting plan would be developed.

2.2.2.3 Electrical Equipment (Cabling, Inverters, and Transformers)

The electrical current produced by solar modules is in the form of direct current. Cables collect and aggregate the direct current before it is converted to alternating current at the inverters and sent to the Project substation. Low-voltage cabling would connect the solar modules and combine multiple strings which then connect to a central inverter, which would convert the direct current to alternating current in accordance with regulatory requirements. Alternatively, string level

inverters may be considered at each string. Following either central- or string-level inverters, power would then enter a step-up transformer converting from low voltage to medium voltage. The transformer output would then connect to the medium voltage 34.5 kV (alternating current) collection system (see Section 2.2.3, Power Collection System).

The number of inverters and transformers would vary depending on the final system configuration.

2.2.3 Power Collection System

2.2.3.1 Underground and Overhead 34.5-kV Collector Lines

Energy generated by the solar array would be collected via 34.5-kV underground and overhead collector cables. The collector cable system would be underground as much as possible for a total of approximately 175,000 linear feet; however, it would be constructed overhead for portions where necessary to avoid impacts to sensitive environmental areas such as streams and wetlands, and to minimize ground disturbance when spanning topographical features. Construction of the underground 34.5-kV cable system would include a 40-foot-wide temporary disturbance, with a 20-foot-wide soil excavation area to dig a 3-foot-deep trench to lay the cable. The trench would be backfilled with the removed soil and restored, including revegetation as appropriate where clearing was done. Project construction will not disturb delineated streams or wetlands (see Section 3.4). Should disturbance to streams or wetlands become necessary, the Applicant would obtain the necessary permits from the state of Washington and the U.S. Army Corps of Engineers (USACE).

Construction of overhead 34.5-kV collector lines would require a 75-foot temporary construction area cleared of vegetation, with soil disturbance limited to a 25-foot width. Overhead sections would be installed on wooden pole structures. In addition, there would be pull/tension areas for the overhead lines, which would be 100 feet by 300 feet at each turning structure. All temporary disturbance related to the collector lines would occur within the fenced 1,871-acre area solar array.

2.2.3.2 Collector Substation

The collector substation would be constructed on a 5-acre site enclosed by approximately 2,000 feet of chain-link fencing. To comply with state requirements, the substation fence would be 7 feet tall topped with 1 foot of barbed wire. An additional 2 acres may be temporarily disturbed during construction. The substation would include transformers to increase the voltage from the 34.5-kV collector system to 230 kV for transmission. Permanent equipment filled with oil would be installed on pedestal foundations surrounded by a moat. This equipment includes the main power transformers as well as grounding transformer(s). The moats would be designed with a minimum size capable of containing all the oil from the device concurrent with a 10-year 24-hour rainfall event. The collector substation would have sufficient spacing between equipment to prevent the spread of fire.

2.2.3.3 Overhead 230-kV Interconnection

An overhead 230-kV interconnection would be constructed from the collector substation to the existing Juniper Canyon 230-kV transmission line. The Juniper Canyon line has capacity to carry the

full output of the Project to the BPA Rock Creek Substation. The layout presented for analysis shows the substation located immediately adjacent to the Juniper Canyon line. As shown, the 230-kV interconnection would require up to two steel monopole structures measuring up to 100 feet in height inside or immediately outside the collector substation. If the solar array is shifted south during final design, the 230-kV interconnection could be up to 6 miles in length, requiring up to approximately 80 steel monopole support structures to reach the Juniper Canyon line.

2.2.4 Operations and Maintenance Building

The Project would either use the nearby existing Big Horn O&M facility or construct a new facility adjacent to the Project substation. If a new O&M facility is constructed, it would include an approximately 5,000-square-foot heated, pre-fabricated steel building, with a workshop/garage, single sink kitchen, one shower, restrooms, and ample office space for the regular personnel. The site would occupy a total of up to 10 acres, including an on-site graveled area for parking and open staging area.

Wastewater would be managed using an on-site septic system, and fresh water would be supplied by an existing commercially available well in the area. If no well is available, a new well would be drilled which would use less than 5,000 gallons per day. Local utilities would provide primary electrical and telephone connections. An on-site liquid petroleum gas generator would provide back-up power.

Associated access roads and the parking area would have sufficient space for emergency response vehicles. All O&M building construction activities would take place within the permanent 10-acre site.

The O&M building would be equipped with fire extinguishers as well as smoke detectors tied to the supervisory control and data acquisition (SCADA) system. In addition to fire extinguishers, the O&M building would have basic firefighting equipment for use on site during maintenance activities including shovels, beaters, portable water for hand sprayers, and personal protective equipment. The equipment would meet National Electrical Code and Institute of Electrical and Electronics Engineers standards and would not pose a significant fire risk.

2.2.5 Access Roads, Fencing, and Additional Construction Areas

2.2.5.1 Existing Roads

An existing county road, Middle Road, crosses the Project area. Project facilities located in the county right-of-way would be limited to electrical wire crossings; easements would be needed on either side of Middle Road to construct overhead or underground crossings for Project cables. Additionally, encroachment permits would be needed in areas where access roads begin at Middle Road. Schrantz Road is adjacent to the Project area along the northwest side. Both county roads would be used during construction and operation to access the Project area. There are also two

existing private unpaved roads in the Project area that are part of the Big Horn wind farm that may be used for Project access.

If the existing Big Horn O&M facility is used, repairs to Big Horn road providing access to that facility would be required through an agreement with Klickitat County. These upgrades may be executed by the county, or by Avangrid during construction of the Lund Hill solar facility.

2.2.5.2 New Permanent Roads

Approximately 22 miles of Project access roads would be constructed within the Project area. Each roadway would include an all-weather compacted gravel bed up to 16 feet wide. This would provide an internal turning radius sufficiently sized for emergency vehicle access in compliance with local fire code. Access roads would be located in between solar strings and would provide entry to the O&M building site and collector substation site.

2.2.5.3 Perimeter Fencing

Chain-link fencing would be installed around the perimeter of the Project area. The fence would likely be 6 feet tall, with an additional foot of barbed wire along the top. If it is determined that barbed wire poses a risk to local wildlife such as deer, an 8-foot chain-link fence without barbed wire may be installed. Approximately eight gates would be provided along the fence line to allow for vehicle and pedestrian access. Gates for vehicles would be 16 feet wide, and pedestrian gates would be 4 feet wide.

A minimum 20-foot, noncombustible, defensible space clearance to serve as a fire break would be present along the inside of the perimeter fence. This will help keep external fires out and internal fires in.

2.2.5.4 Other Infrastructure

Other necessary infrastructure would include a SCADA system, solar meteorological data system, telecommunications infrastructure, and security fencing.

2.2.5.5 Construction Activities

Construction of the Project would last approximately 9 to 12 months. The entire 1,871-acre Project area would generally be available for construction activities and impacts allowing for the minimization of impacts to sensitive areas such as streams, wetlands, rare plants, and cultural resources. The area may include up to three 10-acre graveled staging areas identified within the Project area to store materials and equipment and for refueling. Approximately 2,000 gallons of diesel fuel and 1,000 gallons of unleaded gasoline would be required during construction. Water would be required for dust control during construction, assumed to be 100 gallons per acre per day.

2.2.6 Environmental Management and Safety Plans

Prior to construction, a transportation plan would identify the routes for transporting Project materials, equipment, and personnel to the site, with a description of anticipated traffic volumes,

vehicle weights, trip frequencies, and shipping schedules that would be used during construction of the Project.

An SWPPP and Erosion and Sediment Control Plan would be developed to manage stormwater runoff and reduce potential erosion impacts through BMPs and general construction permitting requirements.

An SPCC Plan would identify specific sites for fueling during construction, and establish procedures for avoiding, containing, and absorbing spilt fuels.

A Fire Prevention and Response Plan would identify the procedures and equipment needed to appropriately manage fire risk during construction and operation of the Project. The construction contractor would be required to provide firefighting equipment during construction, such as shovels, beaters, portable water for hand sprayers, fire extinguishers, and other equipment. Any potential fires inside the Project area would be controlled by trained facility staff with 24-hour access to the facility. In the rare event of an electrical fire in the solar module blocks or substation, it is likely that facility staff would monitor and contain the fire but contact local firefighting services to extinguish it.

2.2.7 Decommissioning

Decommissioning efforts for the Project would occur in the opposite order of construction. The existing service roads would be used to allow the deconstruction contractor to separate the solar modules from the tracker system, and directly load the modules into a truck or roll-off container for off-site disposal or recycling. The contractor would then remove the tracker system, including the steel posts, from the ground and recycle all metal and other materials as possible. The transformers would be decommissioned and disposed of off site. Underground electrical collector lines would remain if they are deeper than 3 feet below grade. The overhead electrical lines and access roads would be removed, and the entire footprint of the facility would be reseeded to return the Project area to a useful, nonhazardous condition.

3.0 Affected Environment, Environmental Consequences, and Mitigation

3.1 Noise

This section presents an evaluation of potential sound¹ that could result from construction and operation of the Project. An essential part of this assessment is a comparison of expected sound levels from the Project with acceptable sound levels presented in applicable regulations.

3.1.1 Acoustic Metrics and Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves (i.e., frequency, wavelength, period, amplitude, and velocity). Noise is defined as unwanted sound. A sound source is defined by a sound power level (L_W), which is independent of any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts (W). Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level (L_P) is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source due to the fact that the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (μPa). Conversely, sound power is commonly referenced to 1 picowatt, which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave (or $33\frac{1}{3}$ octave) bands ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter

¹ Consistent with similar solar facilities, off-site Project operational acoustic impacts at sensitive receptors are expected to be low level. WAC 173-60-0020 defines noise as "the intensity, duration and character of sounds, from any and all sources"; however, the term noise also typically carries a negative connotation. Since the Project is expected to result in minimal acoustic impacts, the assessment discussion will refer to Project emissions in terms of sound rather than noise.

is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted decibels (dBA).

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The equivalent sound level has been shown to provide both an effective and uniform method for comparing time-varying sound levels. Sound levels can also be described using statistical levels (L_n). This descriptor identifies the sound level that is exceeded “n” percent of the time over a measurement period (e.g., L_{90} = sound level exceeded 90 percent of the time). The sound level exceeded for a small percent of the time, L_{10} , closely corresponds to short-term, higher-level, intrusive sounds (such as vehicle pass-by sound near a roadway). The sound level exceeded for a large percent of the time, L_{90} , closely corresponds to continuous, lower-level background sound (such as continuous sound from a distant industrial facility). L_{50} is the level exceeded 50 percent of the time and is typically referred to the median sound level over a given period.

Estimates of sound sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 3.1-1.

Table 3.1-1. Typical Sound Levels Measured in the Environment and Industry

Sound Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (Perception of Different Sound Levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horsepower (hp) siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal Food blender (2 feet) Pneumatic drill (50 feet)	80	Loud	Reference loudness
Vacuum cleaner (10 feet)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 feet)	65		
Large store air-conditioning unit (20 feet)	60		
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 feet)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Adapted from: Beranek 1988; EPA 1971a

3.1.2 Study Methodology

Sound generated by the Project would consist of 1) short-term duration sound during construction, and 2) sound during normal facility operations. Acoustic emission levels for activities associated with Project construction were based on typical ranges of energy-equivalent sound levels at construction sites, as documented by the U.S. Environmental Protection Agency (EPA 1971b) and the EPA's "Construction Noise Control Technology Initiatives" (EPA 1980). The EPA methodology distinguishes between type of construction and construction phase. Using those energy equivalent sound levels as input to a basic propagation model, construction sound levels were calculated at varying distances from the Project.

The Cadna-A® computer sound model (version 2018 MR1) was used to calculate off-site sound pressure levels from the operation of the facility equipment in the vicinity of the Project site. An industry standard, Cadna-A® was developed by DataKustik GmbH (2017) to provide an estimate of sound levels at distances from sources of known emission. It is used by acousticians and acoustic engineers because of its ability to accurately describe sound emission and propagation from complex facilities consisting of various equipment types and, in most cases, yield conservative results of operational sound levels in the surrounding community.

Cadna-A® is a comprehensive three-dimensional acoustic software model that conforms to the International Organization for Standardization (ISO) standard 9613-2, "Attenuation of Sound during Propagation Outdoors" (ISO 1989). The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions.

Cadna-A® allows for three basic types of sound sources to be introduced into the model: point, line, and area sources. Each sound-radiating element was modeled based on its sound emission pattern. Transformers and inverters were modeled as area sources.

Off-site topography was obtained using the publicly available U.S. Geological Survey (USGS) digital elevation data. A default ground attenuation factor of 0.5 was assumed for off-site sound propagation over acoustically "mixed" ground. A ground attenuation factor of 0.0 for a reflective surface was assumed for paved on-site areas.

The output from Cadna-A® includes tabular sound level results at selected receiver locations and sound contour maps identifying areas of equal and similar sound levels.

During Project operation, concurrent operation of the solar facility components and the on-site substation was assumed to be limited to daytime hours only. After sunset, when the plant no longer receives solar radiation, operation of the substation transformer would be limited, the inverters would produce little sound, and the pad-mounted transformers would be energized but likely operating under low-sound condition using natural draft cooling (no fans) because of reduced nighttime heat loads. A three-dimensional rendering of the facility was created directly from the preliminary site plan drawing by defining the height and extent of all modeled sound sources.

Sound power levels were assigned each source in a manner that best represents their expected acoustic performance and are inclusive of a standardized engineering safety factor. For example, transformer walls are defined as area sources.

3.1.3 Affected Environment

As with most utility scale solar facilities, the Project would be located in a rural area with low population density and is expected to have low ambient sound levels, given the lack of industrial and commercial sound sources. Sound is currently generated by existing wind turbines located north, northeast, and southwest of the solar facility siting area.

3.1.3.1 Regulatory Framework

WAC 173-60 provides the applicable “Maximum Environmental Noise Levels” for Washington state, including Klickitat County. Klickitat County has not promulgated independent state-approved noise standards pursuant to WAC 173-60-110. These levels are based on the environmental designation for noise abatement (EDNA), which is defined as “an area or zone (environment) within which maximum permissible levels are established.” There are three EDNA designations (WAC 173-60-030), which roughly correspond to residential, commercial/recreational, and industrial/agricultural uses:

- Class A: Lands where people reside and sleep (such as residential)
- Class B: Lands requiring protection against noise interference with speech (such as commercial/recreational)
- Class C: Lands where economic activities are of such a nature that higher noise levels are anticipated (such as industrial/agricultural)

As used in this section, “noise-sensitive areas” are equivalent to Class A EDNA areas. Table 3.1-2 summarizes the maximum permissible levels applicable to sound received at noise-sensitive areas (Class A EDNA) and at industrial/agricultural areas (Class C EDNA) from an industrial facility (Class C EDNA).

Table 3.1-2. State of Washington Maximum Permissible Environmental Noise Levels (WAC 173-60-040)

Statistical Descriptor	Maximum Permissible Sound Levels (dBA) from a Class C EDNA Source		
	Class A EDNA Receiver		Class C EDNA Receiver
	Daytime (7 a.m. – 10 p.m.)	Nighttime (10 p.m. – 7 a.m.)	Any Time
L_{eq}	60	50	70
L_{25}	65	55	75
$L_{16.7}$	70	60	80
$L_{2.5}$	75	65	85

The noise regulations do not specifically address residences (a Class A use) located on agricultural lands (a Class C use). The most restrictive interpretation of the noise standard is 50 dBA during the nighttime hours at residential sites.

The following are exempted from the limits presented in Table 3.1-2 (per WAC 173-60-050):

- Construction noise (including blasting) between the hours of 7 a.m. and 10 p.m.
- Motor vehicles when regulated by WAC 173-62 (“Motor Vehicle Noise Performance Standards” for vehicles operated on public highways)
- Motor vehicles operated off public highways, except when such noise affects residential receivers
- WAC 173-60-050(6) states, “Nothing in these exemptions is intended to preclude the [Washington State] Department [of Ecology] from requiring installation of the best available noise abatement technology consistent with economic feasibility.”
- WAC 173-62, “Motor Vehicle Noise Performance Standards,” regulates noise generated by vehicles traveling on public roads.

The Applicant is committed to designing and operating the Project in a manner that complies with all applicable sound standards.

3.1.4 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. Potential sound resulting from construction and operation of the Project would not occur.

3.1.5 Impacts of the Project

3.1.5.1 Construction Impacts

Construction activities associated with the Project have the potential for localized sound on a temporary basis as construction activities progress through certain locations within the Project area. Construction activities at the Project can be generally divided into five phases:

1. Site preparation, grading, preparation of staging areas, and on-site access routes;
2. Array foundation and structure installation, conductor installation, and construction of O&M building and control enclosure;
3. Solar panel assembly and connecting electrical components;
4. Inverter pad construction, substation installation, cabling and terminations, and gen-tie construction; and
5. Array and interconnection commissioning, revegetation, and construction of waste removal and recycling.

Note that these activities would occur sequentially for discrete groupings of solar arrays, with the potential for overlap. In addition to the solar panels, construction activities would also occur for

supporting infrastructure. The inverters and distribution transformers are likely to be completed while respective solar arrays are being constructed; other Project-related elements, such as the operations and maintenance building, would occur independently.

Sound generated by Project construction is expected to vary depending on the construction phase. Table 3.1-3 lists the typical sound levels associated with common construction equipment at various distances. Periodically, sound levels may be higher or lower; however, the overall sound levels should generally be lower due to excess attenuation.

Table 3.1-3. Sound Levels from Common Construction Equipment at Various Distances

Construction Equipment	Expected Sound Level by Distance (dBA)			
	50 feet	1,000 feet	2,500 feet	5,000 feet
Bulldozer (250 to 700 hp)	88	62	54	43
Front-end loader (6 to 15 cubic yards)	88	62	54	43
Truck (200 to 400 hp)	86	60	52	41
Grader (13- to 16-foot blade)	85	59	51	40
Shovel (2 to 5 cubic yards)	84	58	50	39
Portable generators (50 to 200 kilowatts)	84	58	50	39
Mobile crane (11 to 20 tons)	83	57	49	38
Concrete pumps (30 to 150 cubic yards)	81	55	47	36
Tractor (0.75 to 2 cubic yards)	80	54	46	35

Source: Barnes et al. 1976

In addition to the above listed construction equipment, pile driving would be needed to install the foundations of the solar modules in areas with bedrock. Pile driving can generate high sound levels. Sound is generated from both the ram striking the pile as well as the operating steam, air, or diesel exhaust as it is exhausted from the cylinder (this is not present with hydraulic impact hammers). A pile driver needed for this type of application is expected to produce a sound pressure level of 111 dBA at 20 feet assuming an impact rate of 1,400 blows per minute. Actual pile driving averages 30 to 45 seconds per pile at a 6-foot embedment depth, and the engine would typically run close to 3,000 rpm. Assuming a load or usage factor of 20 percent, it is expected that sound from pile driving would attenuate to 70 dBA at approximately 1,000 feet and would attenuate to below 60 dBA within 1 mile of this construction activity, depending on meteorological and topographical conditions.

Blasting is anticipated for the foundations and potentially for some road areas but is expected to occur in very limited cases. Blasting activities are specifically exempted from the noise regulations (per WAC 173-60-050 (1)(c)).

Use of major excavating and earth-moving machinery would be conducted between the hours of 7 a.m. and 10 p.m. and therefore would be exempt from the limits presented in Table 3.1-2 (per WAC 173-60-050). Reasonable efforts will be made to minimize the impact of sound resulting from construction activities at proximate noise-sensitive areas using noise mitigation. Because of the temporary nature of the construction sound, no long-term adverse effects are expected.

3.1.5.2 Operational Impacts

The primary sound sources during operations are the inverters and transformers. It is expected that this equipment would operate during the daytime period only. Reference sound power levels inputted in to Cadna-A® were provided by equipment manufacturers, based on information contained in reference documents or developed using empirical methods. The source levels used in the predictive modeling are based on estimated sound power levels that are generally deemed to be conservative. The projected operational sound levels are based on typical sound power levels data for the major sources of equipment. Table 3.1-4 summarizes the equipment sound power level data used as inputs to the initial modeling analysis.

Table 3.1-4. Modeled Octave Band Sound Power Level (L_p) for Major Facility Equipment

Sound Source	Sound Power Level (L_p) by Octave Band Frequency (Hz) in dBA									Broadband Level (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
Inverter Bank	72	80	87	88	87	84	79	72	65	93
Distribution Transformer	34	54	66	68	74	71	67	62	53	77
Substation Transformer	54	74	86	88	94	91	87	82	73	98

Broadband (dBA) sound pressure levels were calculated for expected normal Project operation assuming that all components identified previously are operating continuously and concurrently at the representative manufacturer-rated sound. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a point of reception. Table 3.1-5 shows the projected exterior sound levels resulting from full, normal operation of the facility at the sound sensitive receptors (NSRs). Acoustic modeling results are independent of the existing acoustic environment and represent Project-generated sound levels only.

Table 3.1-5. Acoustic Modeling Results Summary

Sound Sensitive Receptor (NSR)	UTM Coordinate Easting (m)	UTM Coordinate Northing (m)	Received Sound Level, dBA L_{eq}
1	712409.86	5084014.79	45
2	712961.34	5082820.66	43
3	713203.73	5082831.78	44
4	717241.98	5079241.56	20

Full, normal facility operations would occur only during daytime hours, and the major sound-producing equipment would have limited operation during the nighttime period. Acoustic modeling results in Table 3.1-5 demonstrate that even during daytime, the Project would successfully comply with the most restrictive WAC Class A maximum permissible nighttime sound level of 50 dBA L_{eq} at all four NSRs. In the event that the Project layout and/or equipment is adjusted prior to construction, further acoustic analysis will be conducted, and compliance will be reassessed.

3.1.5.3 Indirect or Secondary Impacts

No indirect or secondary impacts have been identified.

3.1.6 Mitigation Measures

The Applicant would design and operate the Project to comply with all applicable noise standards. Following determination of the precise solar array layout, and before construction of the Project, the Applicant would conduct a final acoustical analysis of the layout (for presentation to Klickitat County upon request) documenting that the Project is predicted to comply with the applicable requirements.

Since construction machines operate intermittently, and the types of machines in use at the Project site change with the phase of construction, sound emitted during construction would be mobile and highly variable, making it challenging to control. The construction management protocols would include the following noise mitigation measures to minimize sound impacts:

- Maintain all construction tools and equipment in good operating order according to manufacturers' specifications.
- Limit use of major excavating and earth moving machinery to daytime hours.
- To the extent practicable, schedule construction activity during normal working hours on weekdays when higher sound levels are typically present and are found acceptable. Some limited activities, such as concrete pours, may be required to occur continuously until completion.
- Equip any internal combustion engine used for any purpose on the job or related to the job with a properly operating muffler that is free from rust, holes, and leaks.
- For construction devices that utilize internal combustion engines, ensure the engine's housing doors are kept closed, and that all factory-installed sound-insulating material and baffles are properly installed and mounted on the engine housing consistent with manufacturers' guidelines, if possible.
- Limit potential evening shift work to low-sound activities such as welding, wire pulling, and other similar activities, together with appropriate material-handling equipment to the extent practicable.

3.2 Air Quality

This section describes potential impacts on air quality that could be caused by construction and operation of the Project and identifies mitigation measures, where appropriate, to reduce or avoid these impacts.

3.2.1 Study Methodology

Air quality resources are affected by atmospheric emissions, especially by technologies that combust fossil fuel or biomass. Potential impacts were determined by the amount of emissions attributed to the Project construction and the ground-level concentrations resulting from those emissions. Because no permanent stationary sources of air emissions would operate upon completion of the Project, air quality issues associated with the Project would be limited to

construction emissions and fugitive dust from disturbed soils during construction, and therefore, no stationary source evaluation was conducted.

3.2.2 Affected Environment

3.2.2.1 Climate

Klickitat County is located within a rain shadow created by the Cascade Mountains, which causes a decrease in precipitation to their east. Most of the annual precipitation in Klickitat County occurs between November and March. Average annual precipitation at Bickleton, the town closest to the Project, is 13 inches. The average seasonal snowfall at Bickleton is 31 inches. In unusually severe winters, snow can remain on the ground from late November until early March. In normal years, snow remains on the ground for no longer than 2 to 4 weeks at a time. In winter, temperatures in Bickleton average a high of 37.4 degrees Fahrenheit (°F) and a low of 23.7 °F, with extreme lows below 10°F. In summer, temperatures average a high of 78.2°F and a low of 50.8°F, with extreme highs above 90°F (Western Regional Climate Center 2018).

3.2.2.2 Existing Air Quality

The two most prevalent existing sources of air pollution in Klickitat County are fugitive dust and vehicle emissions. Windblown fugitive dust is prevalent in non-irrigated agricultural areas. Fugitive dust and combustion emissions are generated by agricultural activities, vehicles traveling on dirt roads, construction, and other activities that disturb the soils and use combustion engines.

The nearest air quality monitors to the site are located in Sunnyside, Washington (32 miles to the north) and Toppenish, Washington (33 miles to the north). Particulate matter with aerodynamic radius of 2.5 microns or less (PM_{2.5}) is measured at both locations. The nearest air quality monitors that measure particulate matter with aerodynamic radius of 10 microns or less (PM₁₀) are located in Yakima, Washington (48 miles to the north) and The Dalles, Oregon (48 miles to the southwest). The nearest ozone monitors are located approximately 48 miles away in The Dalles, Oregon (to the southwest) and Hermiston, Oregon (to the east). The closest nitrogen dioxide (NO₂) monitor is located approximately 94 miles to the north in Quincy, Washington. The nearest carbon monoxide (CO) and sulfur dioxide (SO₂) monitors are located approximately 118 miles to the south west in Portland, Oregon.

3.2.2.3 Regulatory Framework

In general, if potential emissions from stationary sources exceed certain thresholds, approval from the appropriate permitting authority is required before construction can begin. A new emissions source must demonstrate compliance with all applicable federal and state air quality requirements, including emissions standards and ambient air quality standards (AAQS). These requirements are described below.

Ecology has established additional AAQS for criteria air pollutants and regulates new sources of toxic air pollutants. New sources of air emissions in areas that do not meet the standards (i.e.,

nonattainment areas) must undergo more rigorous permitting than equivalently sized sources in areas that meet the standards. Klickitat County is an attainment area for all regulated air pollutants. Additional air quality permitting is required if operational emissions are greater than the major source threshold.

Notice of Construction/New Source Review

WAC 463-39 and 173-400 establish the requirements for review and issuance of notice of construction approvals for new sources of air emissions under Ecology jurisdiction. A notice of construction is not required for the Project because there would be no permanent source of regulated air emissions.

Prevention of Significant Deterioration

Prevention of Significant Deterioration (PSD) regulations apply to proposed new or modified sources located in an attainment area that have the potential to emit criteria pollutants in excess of predetermined de minimus values (40 Code of Federal Regulations [CFR] Part 51). For new generation facilities, these values are 100 tons per year of criteria pollutants for 28 specific source categories, or 250 tons per year for sources not included in the 28 categories. A PSD permit would not be required for the Project because the generation of electricity by solar modules does not produce air emissions.

Construction Emissions

Washington State regulates what are known as “fugitive” air emissions, which consist of pollutants that are not emitted through a chimney, smokestack, or similar facility. Blowing dust from construction sites, unpaved roads, and tilled agricultural fields are common sources of fugitive air emissions. Solar energy plants are not included in the facilities for which review and permitting of fugitive emissions are required (WAC 173-400-040). Nevertheless, the Washington State rules require owners and operators of fugitive dust sources to take reasonable measures to prevent dust from becoming airborne and to minimize emissions.

3.2.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. Electrical energy that would have been produced by the facility would need to be obtained from another generation source. Most other conventional sources of electrical energy emit sulfur dioxides, nitrogen oxides, carbon dioxide, and other air pollutants, with consequent air quality degradation. These emissions would be significantly greater than the minimal amount emitted by the facility’s construction activity and operation and maintenance vehicles, its only sources of air emissions.

3.2.4 Impacts of the Proposed Project

3.2.4.1 Construction Impacts

The primary sources of air pollution generated by construction of the Project would be vehicle exhaust emissions and fugitive dust particles from disturbed soils that become airborne.

Sources of vehicle exhaust emissions would include heavy construction equipment operating on the site, trucks delivering construction materials and Project components to the site, and vehicles used by construction workers to access the site. The amount of pollutants emitted from these sources would be relatively small, given the size of the construction workforce and equipment fleet, and similar to emissions from other equipment commonly used for agriculture, transportation, and construction in Klickitat County. The emissions would generally be dispersed among multiple locations in and near the Project site at any given time rather than concentrated in a specific location, and they likely would not reach significant concentrations at off-site locations.

Construction activities that could create fugitive dust include clearing and grading for road improvements and solar array pads, clearing work areas around all types of Project facilities, underground utility cable trenching or plowing. Transportation of materials and supplies would also produce fugitive dust emissions.

Construction activities for the Project are scheduled to take approximately 9 to 12 months. Given the relatively low magnitude, localized extent, and temporary duration of construction-related emissions, air quality impacts associated with Project construction would not be substantial. Consequently, there is no basis to assume that these emissions would contribute to an exceedance of any AAQS.

3.2.4.2 Operational Impacts

All permanent access roads would have gravel surfaces to reduce the potential for fugitive dust generation. No new paved roads would be constructed for this Project. The volume of operation and maintenance vehicle traffic would be very low; therefore, quantities of potential emissions generated by these vehicles would be very small, intermittent, and localized. Areas disturbed during construction and not occupied by permanent Project facilities would be revegetated to prevent blowing dust.

Operation and maintenance impacts on air quality from the Project would be negligible. Combustion emissions and fugitive dust generated by vehicles traveling on Project access roads to perform operation and maintenance functions would be the only emissions expected.

3.2.4.3 Indirect or Secondary Impacts

Indirect impacts in the immediate vicinity of the Project are not anticipated. The Project is not expected to substantially induce regional growth that would result in substantial changes to off-site air quality.

Other pollutants, including greenhouse gases, would be emitted from outside the immediate vicinity, as a result of the total fuel cycle of the Project. These emissions would be generated from

manufacturing and transporting Project parts and equipment. However, according to research on the life cycle of photovoltaics, solar modules produce enough energy to substantially offset the energy and fuel required to manufacture and install them within 1 year of operation (Louwen et al. 2016).

In addition, the Project may displace emissions from other sources of power generation, such as coal or natural-gas-fired power plants that otherwise would have been built or operated to produce an equivalent amount of electricity. Because solar modules do not emit air pollutants during their operation, the quantity of emissions produced by an equivalently sized natural-gas-fired power plant represent an estimate of air pollutant emissions that would be avoided through construction of the proposed solar power facility. Table 3.2-1 summarizes the amount of annual emissions from a hypothetical 150-MW natural-gas-fired combustion turbine power plant that could be operated if the Project were not constructed.

Table 3.2-1. Annual Emissions of Priority Pollutants from a 150-MW Natural-gas-fired Combustion Turbine Power Plant

Pollutant	Quantity (tons per year)
Nitrogen oxides	50
Carbon monoxide	46
Particulate matter	35
Sulfur dioxide	3
Volatile organic compounds	31
Source: Estimated by scaling from the allowable emissions from the permitted 1,300-MW Wallula Power Project (Washington State Energy Facility Site Evaluation Council 2002).	

3.2.5 Mitigation Measures

Fugitive emissions from construction and decommissioning would be controlled through standard construction control practices and methods, such as the following:

- Construction and operations vehicles and equipment would comply with applicable state and federal emissions standards.
- Vehicles and equipment used during construction would be properly maintained to minimize exhaust emissions.
- Operational measures such as limiting engine idling time and shutting down equipment when not in use would be implemented.
- Watering or other fugitive dust-abatement measures would be used as needed to control fugitive dust generated during construction.
- Traffic speeds on unpaved roads would be limited to 25 miles per hour to minimize generation of fugitive dust.
- Truck beds would be covered when transporting dirt or soil.

- Carpooling among construction workers would be encouraged to minimize construction-related traffic and associated emissions.

Expected air quality impacts from construction/decommissioning, operation, and maintenance would be minimal, and therefore, no additional mitigation measures need to be considered.

3.3 Vegetation and Wildlife

This section describes the vegetation and wildlife in the vicinity of the Project and evaluates the potential impacts from construction and operation of the Project. Mitigation measures to minimize or avoid these impacts are identified where appropriate and in Section 3.3.5, Mitigation Measures.

3.3.1 Study Methodology

3.3.1.1 Review of Existing Information

Information regarding vegetation and wildlife in the vicinity of the Project, including special-status species and habitats, were reviewed in the following sources:

- U.S. Fish and Wildlife Service (USFWS) species lists of Threatened, Endangered, Proposed, and Candidate species for Klickitat County (USFWS 2018);
- Washington Department of Fish and Wildlife (WDFW) priority and habitats and species lists and online interactive map (WDFW 2018a,b);
- Washington Natural Heritage Program (WNHP) rare plant geographic information system (GIS) data (WNHP 2018a);
- List of Known Occurrences of Rare Plants in Washington by County (WNHP 2018b);
- Field Guide to the Rare Plants of Washington (WNHP 2018c);
- USFWS National Wetlands Inventory (USFWS 2017);
- USGS National Hydrography Dataset (USGS 2016);
- Ecological baseline studies for the Juniper Canyon Wind Power Project (NWC 2008);
- Ecological baseline studies for the Wilkins-Powers Wind Power Project (NWC 2010);
- Prior habitat survey data from surveys conducted in the vicinity of the project between 2008 and 2010 (NWC 2008, 2010); and
- Draft Environmental Impact Statement for the Lund Hill Wind Energy Project (Pacific Wind Development, LLC 2011).

Information from the above resources, as well as knowledge of habitat preferences and species' ranges, was used to compile a list of special-status species and other taxa of interest that may occur within the Project area.

3.3.1.2 Ecological Baseline Studies

In addition to reviewing the existing information sources listed above, Project-specific baseline surveys were conducted. Project-specific surveys relevant to vegetation and wildlife include habitat mapping, special-status vascular plant surveys, and wetland delineation surveys. Wetland delineation surveys are discussed in Section 3.4, Wetlands and Water Resources.

Habitat mapping surveys were conducted in May and June 2018. These surveys verified or updated habitat types and boundaries previously mapped within the Project study area by Northwest Wildlife Consultants (NWC 2008). Additionally, portions of the Project study area that had not previously been surveyed by Northwest Wildlife Consultants were documented, mapped, and characterized. The Project study area for habitat mapping matches that of the solar facility siting area. Dominant plant species within each habitat type were documented to accurately classify and describe habitat types.

Special-status vascular plant surveys were conducted concurrently with habitat mapping surveys in May and June 2018. Surveys in May focused on early blooming special-status plant species with potential to occur in the solar facility siting area, and surveys conducted in June focused on later blooming special-status plant species. Field surveys were conducted using the Intuitive Controlled survey method (USFS and BLM 1999). This method incorporates meandering transects that traverse the survey area and target the full array of major vegetation types, aspects, topographical features, habitats, and substrate types. While en route, the surveyors searched for special-status plant species, and when the surveyors arrived at an area of high-potential habitat, they conducted a complete survey (i.e., surveyed the entire area of high-potential habitat) for the special-status species. A complete description of survey methodology is provided in the survey report, which is provided under separate cover (Tetra Tech 2018a). In addition to surveys conducted in 2018, the Applicant intends to conduct supplemental raptor nest surveys in 2019 for the solar facility siting area and the area within 2 miles.

3.3.2 Affected Environment

3.3.2.1 Vegetation

The Project area lies within the Columbia Plateau Level III Ecoregion (EPA 2010). This ecoregion is characterized by arid sagebrush steppe and grassland habitats (Thorson et al. 2003). Land within the Columbia Plateau Ecoregion is now used predominantly for dryland agriculture and rangeland or is enrolled in the Conservation Reserve Program (CRP) (Pacific Wind Development, LLC 2011).

Vegetation within the majority of the solar facility siting area has been heavily modified by historic and current agriculture and grazing activity. Wildfire and land management activities (e.g., mowing and cutting or burning of shrubs and trees) have also altered the vegetation within the solar facility siting area. Most of the former agricultural fields within the solar facility siting area appear to have been enrolled in the CRP and are no longer in active agricultural cultivation. Non-native invasive grasses and forbs are prevalent throughout the solar facility siting area as a result of historic farming and historic and current grazing activity.

Eleven vegetation types (discussed in this section as habitat types) were mapped within the solar facility siting area (Figure 3.3-1). Table 3.3-1 lists the acres of each habitat type found within the solar facility siting area. Each of these habitat types are briefly described below.

Table 3.3-1. Habitat Types Mapped in the Solar Facility Siting Area

Habitat Type ^{1/}	Acres within Solar Facility Siting Area	Percent of Solar Facility Siting Area
Conservation Reserve Program (CRP)/revegetated	2,119.2	47%
Dwarf shrub-steppe – native perennial grassland matrix ^{2/}	955.1	21.2%
Upland scrub-shrub	418.5	9.3%
Shrub-steppe ^{1/}	390.8	8.7%
Exotic annual grassland	375.5	8.3%
Native perennial grassland ^{2/}	130.2	2.9%
Dwarf shrub-steppe ^{2/}	73.3	1.6%
Developed/disturbed	39.8	0.9%
Juniper woodland ^{2/}	5.7	0.1%
Riparian scrub-shrub ^{2/}	2.8	0.1%
Escarpment/talus ^{2/}	2.3	0.1%
Total	4,513.2	100%
1/ Small wetlands are included in the habitat types in this table, totaling approximately 5 acres		
2/ Listed as a High Priority Habitat or Priority Habitat Feature by the WDFW (WDFW 2018a)		

Conservation Reserve Program/Revegetated

The CRP/revegetated habitat type is the most prevalent habitat type mapped within the solar facility siting area. This habitat type includes former agricultural lands that have been revegetated with native and/or non-native grasses and native shrubs. Some or all of these revegetated areas may be enrolled in the CRP. However, information regarding CRP contracts (i.e., parcels enrolled in the CRP) is not readily available; therefore, it is not always possible to verify which parcels have been or are currently enrolled in the CRP program.

Lands mapped as CRP/revegetated within the solar facility siting area include areas revegetated with non-native perennial grass species such as crested wheatgrass (*Agropyron cristatum*), tall wheatgrass (*Thinopyrum ponticum*), and intermediate wheatgrass (*Thinopyrum intermedium*), as well as areas revegetated primarily with native perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg bluegrass (*Poa secunda*), and big bluegrass (a cultivar of *Poa secunda* formerly known as *Poa ampla*). Native shrubs, including rubber rabbitbrush (*Ericameria nauseosa*) and green rabbitbrush (*Chrysothamnus viscidiflorus*), as well as longspur lupine (*Lupinus arbustus* ssp. *pseudoparviflorus*), a forb/sub-shrub, have begun to colonize older CRP/revegetated lands. Areas where these shrubs are not “controlled” through mowing and burning eventually transition into the upland shrub-scrub habitat (described below).

The quality of this habitat type varies with some areas of CRP/revegetated habitat containing a higher predominance of native species such as bluebunch wheatgrass, big bluegrass, common yarrow (*Achillea millefolium*), lupine (*Lupinus* spp.) and lower cover of non-native invasive species.

Other areas of CRP/revegetated habitat within the solar facility siting area contain a high predominance of non-native species including the planted perennial grasses crested wheatgrass, tall wheatgrass, and intermediate wheatgrass, as well as higher cover of non-native invasive species, such as soft brome (*Bromus hordeaceus*), cheatgrass (*Bromus tectorum*), bulbous bluegrass (*Poa bulbosa*), ventenata (*Ventenata dubia*), redstem stork's bill (*Erodium cicutarium*), prickly lettuce (*Lactuca serriola*), and yellow salsify (*Tragopogon dubius*).

Revegetated grasslands, especially those that are well-established with some shrub cover, provide some nesting, cover, and foraging habitat for birds. Species that may use this habitat include vesper sparrow (*Pooecetes gramineus*), grasshopper sparrow (*Ammodramus savannarum*), and Brewer's sparrow (*Spizella breweri*) (Schroeder and Vander Haegen 2006).

Developed/Disturbed

Developed/disturbed areas within the solar facility siting area include roads, old structures, and waste areas associated with past agricultural activity. Most of these developed/disturbed areas are unvegetated; however, vegetated areas are dominated by non-native invasive species such as cheatgrass, soft brome, bulbous bluegrass, medusahead (*Taeniatherum caput-medusae*), prickly lettuce, yellow salsify, clasping pepperweed (*Lepidium perfoliatum*), and hairy vetch (*Vicia villosa*). These areas typically provide little value to wildlife with the exception of structures that can provide perches for raptors and other birds, or roosts for bats or owls.

Dwarf Shrub-steppe

The dwarf shrub-steppe habitat type occurs on lithosol soils, which are shallow, rocky soils typically composed of unweathered or partly weathered rock fragments lacking well-defined soil horizons. Due to the unique characteristics of lithosol soils, vegetation communities in these areas are readily distinguishable from nearby grassland or shrub-steppe communities. Vegetation cover is typically sparse and consists of small shrubs and sub-shrubs, such as stiff sagebrush (*Artemisia rigida*), several species of buckwheat (*Eriogonum douglasii*, *E. heracleoides*, *E. niveum*, *E. sphaerocephalum*, *E. strictum*), spiny phlox (*Phlox hoodii*), and narrowleaf goldenweed (*Nestotus stenophyllus*), interspersed with grasses and forbs. In less disturbed areas of dwarf shrub-steppe habitat, native grasses, including Sandberg bluegrass and squirreltail (*Elymus elymoides*), and forbs, including tapertip onion (*Allium acuminatum*), Nevius' garlic (*Allium nevii*), purple cushion fleabane (*Erigeron poliospermus*), bare-stem lomatium (*Lomatium nudicaule*) and sagebrush violet (*Viola trinervata*) are common. In more highly disturbed dwarf shrub-steppe habitat, high cover of non-native grasses including soft brome, cheatgrass, bulbous bluegrass, and ventenata, is prevalent. Shrub-steppe, including dwarf shrub-steppe, is considered a priority habitat by the WDFW (WDFW 2018a). Additionally, the WDNR lists the Rock Buckwheat (*Eriogonum sphaerocephalum*) – Sandberg Bluegrass, Snow Buckwheat (*Eriogonum niveum*) – Sandberg bluegrass, and Stiff Sagebrush – Sandberg Bluegrass plant communities as conservation priorities in the Columbia Plateau ecoregion (WDNR 2018a).

Dwarf shrub-steppe habitat is widely distributed throughout the solar facility siting area, although it is typically interspersed with native perennial grasslands forming a dwarf shrub-steppe – native

perennial grassland matrix (described below). Areas mapped solely as dwarf shrub-steppe are primarily found in the northeast portion of the solar facility siting area (Figure 3.3-1).

Dwarf shrub-steppe habitat offers foraging and breeding habitat for some birds, including long-billed curlew (*Numenius americanus*), vesper sparrow, and sage thrasher (*Oreoscoptes montanus*) (Johnson and O'Neil 2001; Pampush and Anthony 1993; Downes 2004). Small mammals forage in dwarf shrub-steppe habitat, including the Townsend's ground squirrel (*Urocitellus townsendii*) and northern grasshopper mouse (*Onychomys leucogaster*). The short-horned lizard (*Phrynosoma douglassii*) is expected to occur in this habitat, and the state candidate sagebrush lizard (*Sceloporus graciosus*) has been observed using this habitat (Kronner et al. 2008).

Dwarf Shrub-steppe – Native Perennial Grassland Matrix

Dwarf shrub-steppe – native perennial grassland matrix habitat is the second most predominant habitat type mapped within the solar facility siting area. This habitat type is widely distributed throughout the solar facility siting area (Figure 3.3-1).

This habitat type consists of areas of dwarf shrub-steppe vegetation interspersed with native perennial grassland vegetation. Typically, the native perennial grassland vegetation is found on mounds occurring within dwarf shrub-steppe habitat. This interspersed shallow, rocky-soiled dwarf shrub-steppe with mounds of perennial grassland found on deeper soils is also referred to as “biscuit and swale” habitat or biscuit-swale topography. Dominant species in this habitat type are similar to those listed for dwarf shrub-steppe habitat and native perennial grassland (described below). Much of the dwarf shrub-steppe – native perennial grassland matrix habitat within the solar facility siting area is heavily disturbed and contains high cover of non-native grasses and forbs including soft brome, cheatgrass, bulbous bluegrass, ventenata, hairy vetch, and yellow salsify. Both dwarf shrub-steppe and native perennial grassland (i.e., eastside steppe) are considered priority habitats by the WDFW (WDFW 2018a). Additionally, the WDNR lists the “Bluebunch Wheatgrass – Sandberg Bluegrass Lithosol” plant community as a high conservation priority plant community in the Columbia Plateau ecoregion (WDNR 2018a). The transitional nature of this habitat typically supports a greater diversity of wildlife than the dwarf shrub-steppe or native grassland habitats alone; however, the level of habitat fragmentation from past disturbance in the solar facility siting area likely reduces its value to wildlife.

Escarpment/Talus

One small area of escarpment/talus is located along a ridge in the southwest corner of the solar facility siting area. This habitat type is comprised of linear basalt outcrops with talus beneath the outcrops. Due to the rocky nature, vegetative cover is low in the escarpment/talus habitat type. Vegetation that does occur includes bluebunch wheatgrass, Sandberg bluegrass, tapertip onion, Leiberg's milkvetch (*Astragalus leibergii*), weak-stem cryptantha (*Cryptantha flaccida*), bigseed desert-parsley (*Lomatium macrocarpum*), silverleaf phacelia (*Phacelia hastata*), Lewis' mock orange (*Philadelphus lewisii*), phlox (*Phlox* spp.), and wax currant (*Ribes cereum*). Escarpment/talus is considered a priority habitat feature by the WDFW (WDFW 2018a). Escarpments can provide important perching opportunities for raptors and other birds, and if large enough, can provide

nesting habitat for raptors. Escarpments can also provide bat roosting habitat and associated talus slopes to support reptiles, bats, and small mammals such as marmots (*Marmota flaviventris*) and California ground squirrels (*Otospermophilus beecheyi*).

Exotic Annual Grassland

The exotic annual grassland habitat type was primarily observed in the central portion of the solar facility siting area (Figure 3.3-1). Dominant species in exotic annual grassland habitat include non-native invasive annual and perennial grasses, such as soft brome, cheatgrass, medusahead, ventenata, and bulbous bluegrass, and non-native forbs including field bindweed (*Convolvulus arvensis*), redstem stork's bill, prickly lettuce, yellow salsify, tumbled mustard (*Sisymbrium altissimum*), and hairy vetch. Although native forbs, such as common yarrow and hawkbeard (*Crepis* spp.), are scattered throughout this habitat type, they typically represent a small percent of the overall vegetative cover. Exotic annual grasslands show lower use by grassland birds compared to native perennial grasslands, with some exceptions such as the long-billed curlew that prefers the reduced vertical structure typical of annual grasslands (Earnst and Holmes 2011). Forage value to wildlife is reduced in an exotic annual grassland compared to native perennial grasslands.

Juniper Woodland

Two small areas of juniper woodland occur within the central-eastern portion of the solar facility siting area. Both areas of juniper woodland habitat are associated with ephemeral drainages. This habitat type consists of a relatively closed canopy of western juniper (*Juniperus occidentalis*) with a sparse cover of shrubs, grasses and forbs, including common snowberry (*Symphoricarpos albus*), bluebunch wheatgrass, cheatgrass, blue wildrye (*Elymus glaucus* ssp. *glaucus*), bulbous bluegrass, Kentucky bluegrass (*Poa pratensis*), bur chervil (*Anthriscus caucalis*), and common bedstraw (*Galium aparine*). Juniper woodland is considered a priority habitat by the WDFW (WDFW 2018a). Juniper woodlands provide forage, cover, and nesting habitat for raptors and several passerines (Johnson and O'Neil 2001). Small mammals and bats also use juniper woodlands. Other mammals, such as mule deer (*Odocoileus hemionus*), use juniper as thermal cover.

Native Perennial Grassland

Only a limited portion of the solar facility siting area consists of native perennial grassland habitat. However, as stated above, native perennial grasslands are also found throughout the solar facility siting area interspersed with dwarf shrub-steppe habitat, forming a matrix of dwarf shrub-steppe – native perennial grassland habitat. The ecological condition of native perennial grassland habitat within the solar facility siting area varies. Native perennial grassland habitat in the northern part of the solar facility siting area consists primarily of bluebunch wheatgrass and big bluegrass, with heavy cover of non-native grasses including soft brome, cheatgrass, and bulbous bluegrass. Although native forbs such as common yarrow, arrowleaf balsamroot (*Balsamorhiza sagittata*), hawkbeard, and shaggy fleabane (*Erigeron pumilis*) occur in these areas, overall cover and diversity of forbs in these areas is relatively low.

In contrast, native perennial grassland habitat mapped along the southwestern edge of the solar facility siting area contains much higher cover and diversity of native forbs and lower cover of non-native grasses. Species occurring in this area of native perennial grassland include bluebunch wheatgrass, Sandberg bluegrass, common yarrow, Leiberg's milkvetch, threadstalk milkvetch (*Astragalus speirocarpus*), balsamroot (*Balsamorhiza* spp.), desert yellow fleabane (*Erigeron linearis*), purple cushion fleabane, giant desert-parsley (*Lomatium dissectum*), lupine, and silverleaf phacelia.

Although cover of shrubs is typically less than 5 to 10 percent in native perennial grassland habitat, both rubber and green rabbitbrush occur in most areas of native perennial grassland habitat within the solar facility siting area. Native perennial grassland (i.e., eastside steppe) is considered a priority habitat by the WDFW (WDFW 2018a). Additionally, the WDNR lists the Bluebunch Wheatgrass – Sandberg Bluegrass plant community as a high conservation priority in the Columbia Plateau ecoregion (WDNR 2018a).

Native grasslands provide nesting, cover, and foraging habitat for numerous birds and small mammals, including grasshopper sparrow, vesper sparrow, burrowing owl (*Athene cunicularia*), long-billed curlew (Pampush and Anthony 1993), and white-tailed jackrabbit (*Lepus townsendii*) (Johnson and O'Neil 2001). Mule deer commonly forage in native grasslands.

Riparian Scrub-shrub

One area of riparian scrub-shrub habitat occurs along the southern portion of an intermittent drainage located in the northeast corner of the solar facility siting area (Figure 3.3-1). Species observed in this area include the shrubs Douglas hawthorn (*Crataegus douglasii*), chokecherry (*Prunus virginiana*), Wood's rose (*Rosa woodsii*), willows (*Salix* spp.), and common snowberry, as well as a variety of native and non-native forbs including bur chervil, Canada thistle (*Cirsium arvense*), spikerushes (*Eleocharis* spp.), mountain rush (*Juncus arcticus* ssp. *littoralis*), cinquefoils (*Potentilla* spp.), curly dock (*Rumex crispus*), water speedwell (*Veronica anagallis-aquatica*), and deathcamas (*Toxicoscordion* spp.). Grasses in this area include the native basin wildrye (*Leymus cinereus*) as well as non-native invasive grasses including soft brome, cheatgrass, bulbous bluegrass, and medusahead. Riparian habitat is considered a priority habitat by the WDFW (WDFW 2018a). These areas have high wildlife use and provide forage, hiding, and breeding habitat for a variety of wildlife species.

Shrub-steppe

This habitat type is characterized by a relatively open to dense (20 to 80 percent) cover of native shrubs. Shrub composition is variable; however, typical species observed in shrub-steppe habitat within the solar facility siting area include three-tip sagebrush (*Artemisia tripartita*), basin big sagebrush (*Artemisia tridentata*), rubber rabbitbrush and green rabbitbrush, cream buckwheat (*Eriogonum heracleoides*), and spineless horsebrush (*Tetradymia canescens*). Broom snakeweed (*Gutierrezia sarothrae*) is also common in shrub-steppe habitat in the southern portion of the solar facility siting area.

Cover and diversity of grasses and forbs is variable within this habitat type; however, cover of non-native grasses, including soft brome, cheatgrass, and bulbous bluegrass, is typically high. Other

grasses and forbs observed in shrub-steppe habitat include Sandberg bluegrass, bluebunch wheatgrass, small fescue (*Vulpia microstachys*), common yarrow, annual agoseris (*Agoseris heterophylla*), low pussytoes (*Antennaria dimorpha*), woolly-pod milkvetch (*Astragalus purshii*), redstem stork's bill, jagged chickweed (*Holosteum umbellatum*), bare-stem lomatium, and yellow salsify. Shrub-steppe is considered a priority habitat by the WDFW (WDFW 2018a). Additionally, the WDNR lists the Threetip Sagebrush – Bluebunch Wheatgrass plant community as a conservation priority in the Columbia Plateau ecoregion (WDNR 2018a).

Wildlife value of shrub-steppe habitats is variable, depending on habitat quality. Where older shrub-steppe communities are still relatively intact, higher structural complexity and native-species cover supply high-quality habitat for numerous sensitive species, including Swainson's hawk (*Buteo swainsoni*), ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), loggerhead shrike (*Lanius ludovicianus*), and sage thrasher (*Oreoscoptes montanus*) (Johnson and O'Neil 2001).

Upland Scrub-shrub

The upland scrub-shrub habitat type is typically found on older CRP/revegetated lands where shrubs, primarily rubber and green rabbitbrush, have recolonized. Shrub cover in this habitat type is typically greater than 50 percent. The sub-shrub longspur lupine is also prevalent in upland scrub-shrub habitat, especially in the northern portion of the solar facility siting area. Cover of non-native grasses, including soft brome, cheatgrass, bulbous bluegrass, medusahead, and ventenata, is typically high in upland scrub-shrub habitat. Native grasses including squirreltail and bluebunch wheatgrass occur in this habitat type; however, they typically occur in much lower density than non-native grasses. Forb diversity in this habitat type is relatively low and consisted of a mix of native species, including common yarrow, fiddleneck (*Amsinckia* spp.), hawksbeard, as well as non-native weedy species such as redstem stork's bill, tumbled mustard, and yellow salsify. This habitat provides moderate value to wildlife because of the shrub structural component that provides more forage and cover opportunity than grassland alone. However, the abundance of non-native grasses and low forb diversity limit the potential use by wildlife.

3.3.2.2 Special-Status Plant Species

For purposes of this EIS, the term "special-status plant" includes federal- or state-listed endangered, threatened, or candidate vascular plant species and state-listed sensitive vascular plant species as listed by the WNHP. Field surveys conducted within the solar facility siting area in 2018 did not locate any federally listed plant species. Two state-listed threatened species, hot-rock penstemon (*Penstemon deustus* var. *variabilis*) and foxtail mousetail (*Myosurus clavicaulis*), were observed within the solar facility siting area in 2018. Additionally, vernal pool mousetail (*Myosurus sessilis*) was observed within the solar facility siting area in 2018. Prior to these surveys, vernal pool mousetail, a state candidate species in Oregon and a globally imperiled (G2) species according to NatureServe (2018), was not known to occur in Washington. Because this species has a global ranking of imperiled (G2), and because this observation is currently the only known population in the state of Washington, this species would qualify as a state endangered species (W. Fertig,

botanist WNHP, personal communication, July 19, 2018). Table 3.3-2 summarizes the observations of these three special-status plant species within the solar facility siting area.

Table 3.3-2. Special-status Plant Species within the Solar Facility Siting Area

Species	State of Washington Status ^{1/}	Occurrences within Solar Facility Siting Area	Habitat and Notes
Hot-rock penstemon (<i>Penstemon deustus</i> var. <i>variabilis</i>)	Threatened	4 subpopulations documented, ranging from 2 to 300 individuals.	3 subpopulations located within or adjacent to intermittent and ephemeral drainages; 1 subpopulation located within upland shrub-scrub habitat. Most plants found in areas dominated by non-native species such as cheatgrass, soft brome, ventenata, and yellow salsify.
Foxtail mousetail (<i>Myosurus clavicaulis</i>)	Threatened	1 population documented; approximately 100 plants observed.	Observed within small vernal pool adjacent to dirt road within upland scrub-shrub vegetation; cattle use of vernal pool evident. Associated species include vernal pool mousetail, Scouler's popcornflower (<i>Plagiobothrys scouleri</i>), prostrate knotweed (<i>Polygonum aviculare</i>), disc mayweed (<i>Matricaria discoidea</i>), and Mediterranean barley (<i>Hordeum marinum</i>).
Vernal pool mousetail (<i>Myosurus sessilis</i>)	Endangered ^{2/}	1 population documented; more than 1,000 plants observed.	Observed within small vernal pool adjacent to dirt road within upland scrub-shrub vegetation; cattle use of vernal pool evident. Associated species include Scouler's popcornflower, prostrate knotweed, disc mayweed, and Mediterranean barley.
<p>1/ State of Washington Status per the 2018 Washington Vascular Plant Species of Special Concern (WNHP 2018d). 2/ Vernal pool mousetail has not previously been documented in Washington; therefore, it is not currently included in the vascular plant species of special concern list (WNHP 2018d). However, this species has a global ranking of G2 (imperiled) according to NatureServe (2018) and, since this is the only known population in Washington, it would qualify as a "state endangered" species (W. Fertig, personal communication, July 19, 2018).</p>			

3.3.2.3 Wildlife

This section describes the wildlife species documented to occur or that potentially occur in the solar facility siting area.

Birds

The solar facility siting area is located within the Pacific Flyway, one of four principal north-south bird migration routes in North America. Bounded roughly by the Pacific Ocean to the west and the Rocky Mountains to the east, the Pacific Flyway extends from the arctic regions of Alaska and Canada to Central and South America. Within the flyway, certain groups of birds may travel along narrower migration corridors. Given the project's location along the eastern flank of the Cascades and due north of the Columbia River, it may occur within migration corridors of several bird species, including songbird, waterfowl/waterbird/shorebird, and raptor.

Primary habitat for birds in the solar facility siting area includes grassland and shrubland types. CRP, exotic annual, and native perennial grasslands occur in the Project area, with CRP being the most abundant. Shrublands include dwarf shrub-steppe, upland scrub-shrub, and shrub-steppe habitat types.

Avian point count surveys conducted for Juniper Canyon (NWC 2008) and Lund Hill (NWC 2010) wind energy projects provide information on bird species expected to be encountered in the solar facility siting area. Songbirds were the most common avian guild (i.e., a group that uses similar resources) recorded during those surveys with horned lark and western meadowlark being the species most often observed. Corvids (e.g., ravens, crows, magpies) were the next most common guild followed by raptors. Raptor species identified as most abundant during avian use surveys were rough-legged hawk, American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), and northern harrier (*Circus hudsonius*). Waterfowl/waterbirds/shorebirds were also observed during migratory fly-overs.

Bats

WDFW indicates that 12 of the 15 species of bats in the state of Washington are expected to occur in Klickitat County (Hayes and Wiles 2013). All bat species in Washington have largely insectivorous diets and forage at dusk, night, and dawn. Insectivorous bats capture their prey aerially or by gleaning them from foliage, the ground, or the surface of the water (Hayes and Wiles 2013). Bats that occur in Klickitat County include the big brown bat (*Eptesicus fuscus*), California myotis (*Myotis californicus*), canyon bat (*Parastrellus hesperus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), pallid bat (*Antrozous pallidus*), silver-haired bat (*Lasionycteris noctivagans*), Townsend's big-eared bat (*Corynorhinus townsendii*), western long-eared myotis (*Myotis evotis*), western small-footed myotis (*Myotis ciliolabrum*), and Yuma myotis (*Myotis yumanensis*) (Hayes and Wiles 2013). None of the bat species that occur in Washington are listed as endangered or threatened under federal or state law. The Townsend's big-eared bat is a state candidate species and was observed at the Miller Ranch Wind Project in Klickitat County, which is a previously permitted but not constructed project that would have been located immediately west and southwest of the solar facility siting area on the west side of Bighorn Canyon (Northwest Wind Partners 2007).

The most important habitat for bats are those used for roosting and foraging. While the hoary bat roosts almost exclusively in trees, nearly all other bat species in Washington use a variety of roost structures (caves, rock crevices, human structures) if optimal environmental conditions exist (Hayes and Wiles 2013). Potentially suitable bat roosting habitat within the solar facility siting area is limited but includes some escarpment/talus habitat and sparse upland woodlands. Additional bat roosting habitat exists immediately adjacent to the solar facility siting area in the form of human structures and rock crevices in talus slopes and canyon features within Wood Gulch, Big Horn Canyon, and Pine Creek drainages. In Washington's grassland and shrub-steppe habitat, some bats favor foraging in riparian zones while others feed broadly across grasslands and shrub-steppe, drinking sites being a key component in these dry habitats (Hayes and Wiles 2013). The intermittent and ephemeral streams and wetlands (see Section 3.4) within the solar facility siting area provide foraging habitat and drinking sites for bats.

Raptor Nests

The solar facility siting area is dominated by CRP, grassland, and shrub-steppe habitat in a mostly open, gently sloped plateau between two drainages. Habitat for nesting raptors is generally limited to the cliff and canyon habitat found in those two drainages, Wood Gulch and Big Horn Canyon to the west of the solar facility siting area and Pine Creek drainage to the east. Within the solar facility siting area, the grassland and shrubland habitat can be used by ground-nesting raptors (such as short-eared owl) and lone juniper trees provide additional nesting and perching opportunities.

During raptor nest surveys performed for Juniper Canyon (NWC 2008) and Lund Hill (NWC 2010) wind energy projects, approximately 60 nests were identified within 2 miles of the solar facility siting area. About half of these nests were identified as common raven nests or inactive nests. Common raven nests and inactive nests are recorded during raptor nest surveys because they can be used by raptors in subsequent breeding seasons. Species that were observed nesting during these surveys and whose nest were within 2 miles of the solar facility area include American kestrel, ferruginous hawk, great horned owl (*Bubo virginianus*), golden eagle (*Aquila chrysaetos*), prairie falcon, red-tailed hawk, and Swainson's hawk. Common raven nests and a Swainson's hawk nest were identified within the solar facility siting area, along with several inactive nests. Monitoring of these nests has been ongoing as part of risk management associated with operational wind farms in the area. Raptor nest surveys are scheduled to be completed in 2019 for the solar facility siting area and the area within 2 miles.

Big Game

WDFW considers elk (*Cervus canadensis*), deer, black bear (*Ursus americanus*), moose (*Alces alces*), pronghorn antelope (*Antilocapra americana*), mountain goat (*Oreamnos americanus*), bighorn sheep (*Ovis canadensis*), and cougar (*Puma concolor*) to be big game animals (WDFW 2018c). The solar facility siting area is on the edge of modeled distribution for black bear and cougar (Washington NatureMapping Program 2018); however, these species are unlikely to occur because of a lack of preferred habitat and are therefore not discussed further. Of the remaining big game animals, pronghorn antelope and mule deer are expected to occur in the solar facility siting area. Recent efforts to reintroduce pronghorn antelope on the Yakama Reservation have been successful, with animals being observed south and east of the Yakama Reservation and east of Highway 97 in Klickitat County (Oyster et al. 2017).

Mule deer are common throughout eastern Washington and are of importance to the people of Washington (WDFW 2016). Mule deer inhabit open bunchgrass hillsides along the breaks of the Columbia River as well as dry shrub-steppe of the Columbia Plateau (WDFW 2016). There are no mule deer priority habitats in the solar facility siting area according to the WDFW Priority Habitat Species map (WDFW 2018d). The nearest mule deer priority habitat is a winter concentration area 4 miles to the east of the solar facility siting area, in Glass Canyon.

The solar facility siting area is in the East Columbia Gorge mule deer management zone, which covers 4,547 square miles (approximately 2.9 million acres) and contains a mix of migratory and resident populations that have experienced recent population declines (WDFW 2016). Migratory

herds spend the summer in the Cascade Mountains and move eastward to lower elevations for the winter. Habitat conversion for alternative energy development and agricultural use (vineyard development) is identified by WDFW as special considerations for management of this population (WDFW 2016). Important migratory corridors and stopover sites have not been identified in the East Columbia Gorge mule deer management zone. However, WDFW lists identifying migratory corridors and stopover sites in their Washington Action Plan for implementing Secretarial Order 3362² (Washington Action Plan n.d.) to better understand the influence of energy development and habitat conversion on this population (WDFW 2018e).

Other Terrestrial Wildlife

Other mammals that may occur in the solar facility siting area include American badger (*Taxidea taxus*), coyote (*Canis latrans*), ground squirrels, rabbits, voles (*Microtus spp.*), and mice. Several species of reptiles such as racer (*Coluber constrictor*), sagebrush lizard, and western fence lizard (*Sceloporus occidentalis*) are also likely to occur.

Fisheries and Aquatic Wildlife

Portions of three major drainages flow adjacent to the solar facility siting area: Big Horn Canyon, Pine Creek, and Wood Gulch. Some of their tributaries cross through the solar facility siting area and have been identified as intermittent and ephemeral streams (see Section 3.4). The Wood Gulch drainage becomes a perennial stream south and west of the solar facility siting area, according to the National Hydrography Dataset. The Big Horn Canyon drainage flows into the Wood Gulch drainage, and the Wood Gulch and Pine Creek drainages flow into the Columbia River.

All three drainages support anadromous steelhead populations, although the steelhead distribution ends within Pine Creek and Big Horn Canyon drainages downstream of where they cross the solar facility siting area (StreamNet 2012). The streams and tributaries within the solar facility siting area do not support any known fisheries. A more detailed discussion on surface water features is provided in Section 3.4, Wetlands and Water Resources.

3.3.2.4 Special-Status Wildlife

No critical fish and wildlife habitat conservation areas occur within the solar facility siting area according to the Klickitat County Critical Areas Ordinance.

Special-status wildlife includes Washington State species of concern (WDFW 2018f) and USFWS Birds of Conservation Concern (USFWS 2008). Wildlife species of concern in Washington state include those species listed as State Endangered, State Threatened, State Sensitive, or State Candidate, as well as species listed or proposed for listing by the USFWS or the National Marine Fisheries Service. USFWS Birds of Conservation Concern includes nongame birds that are the

²Secretarial Order 3362 directs appropriate bureaus (U.S. Fish and Wildlife Service [USFWS], National Park Service [NPS], and Bureau of Land Management [BLM]) within the Department of the Interior (DOI) to work in close partnership with the State of Washington to enhance and improve the quality of big-game winter range and migration corridor habitat on federal lands under the management jurisdiction of the DOI in a way that recognizes state authority to conserve and manage big-game species and respects private property rights.

highest conservation priority of the USFWS other than those species listed under the Endangered Species Act (ESA). Table 3.3-3 identifies special-status wildlife with the potential to occur within the solar facility siting area.

Table 3.3-3. Special-status Wildlife with the Potential to Occur within the Solar Facility Siting Area

Common Name	Scientific Name	Status ^{1/}	Habitat Use
Birds			
Brewer's sparrow	<i>Spizella breweri</i>	BoCC	Nests in big sagebrush; rubber rabbitbrush.
Burrowing owl	<i>Athene cunicularia</i>	SC	Open dry grasslands, rangelands, and desert.
Ferruginous hawk	<i>Buteo regalis</i>	BoCC, ST	Shrub-steppe and grassland habitat, often associated with habitat used by ground squirrels. Nests in trees, cliffs, artificial structures, and occasionally on the ground. Known nests within 2 miles of the solar facility siting area.
Golden eagle	<i>Aquila chrysaetos</i>	BoCC, SC	Cliff habitat and large trees provide nesting and roosting habitat. Known nests within 2 miles of the solar facility siting area. No nesting habitat is available within the solar facility siting area; foraging habitat is available.
Loggerhead shrike	<i>Lanius ludovicianus</i>	BoCC, SC	Nests in shrub-steppe, open woodlands.
Long-billed curlew	<i>Numenius americanus</i>	BoCC	Short grasslands and agricultural fields.
Sage thrasher	<i>Oreoscoptes montanus</i>	BoCC, SC	Grassland, shrub savanna, and shrub habitats in steppe zones.
Sagebrush sparrow	<i>Artemisospiza nevadensis</i>	BoCC, SC	Sagebrush scrub.
Mammals			
Black-tailed jackrabbit	<i>Lepus californicus</i>	SC	Sagebrush and rabbitbrush dominated habitats, tend to occupy areas with more shrubs than white-tailed jackrabbit.
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SC	Occupy a broad range of arid and moist habitat; including shrub-steppe, riparian habitat, and open fields. Roosts in caves, mines, structures, rock crevices, and large trees.
Townsend's ground squirrel	<i>Urocitellus townsendii</i>	SC	Inhabit shrub-steppe, native grasslands, pastures, orchards, vineyards, and disturbed areas. Known occurrence within the solar facility siting area.
White-tailed jackrabbit	<i>Lepus townsendii</i>	SC	Arid, hilly bunchgrass sites and sagebrush valleys. Documented within the solar facility siting area.
Amphibians/Reptiles			
Sagebrush lizard	<i>Sceloporus graciosus</i>	SC	Shrub-steppe habitat and open juniper forest.
Striped whipsnake	<i>Masticophis taeniatus</i>	SC	Grasslands, sagebrush flats and dry rocky canyons.
Western toad	<i>Anaxyrus boreas</i>	SC	Lives primarily on land, but breeding occurs in ponds, lakes, and slow-moving streams. Breeding habitat is absent but proximity to water makes it possible for this species to be found in upland areas within the solar facility siting area.
1/ BoCC = Birds of Conservation Concern, ST = State Threatened, SC = State Candidate			

3.3.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. Therefore, there would be no new impacts to vegetation or wildlife under the No Build Alternative.

3.3.4 Construction and Operational Impacts of the Project

3.3.4.1 Vegetation

Construction and operation of the Project would result in permanent impacts of up to approximately 1,871 acres of vegetation. Actual impacts would be lower because mapped streams, wetlands, and rare plants within the fenced area would be avoided by construction activity. Table 3.3-4 summarizes the impacts to habitat types from construction and operation of the Project.

Project construction would include clearing and/or crushing of vegetation. Although vegetation would be allowed to grow under the solar panels following construction, this vegetation would be maintained in an early successional stage or low-stature during operations. In addition to the direct loss of vegetation, removal of vegetation would also increase the potential for soil erosion and reduce the amount of available wildlife habitat. Other potential impacts to vegetation and habitat types from construction and operation of the Project include the introduction and spread of noxious weeds and invasive species, increased risk of wildfire, and increased levels of fugitive dust.

Table 3.3-4. Impacts to Habitat Types from the Project

Habitat Type	Permanent Impacts (Acres)
Conservation Reserve Program/revegetated	860.0
Dwarf shrub-steppe – native perennial grassland matrix ^{1/}	352.9
Shrub-steppe ^{1/}	321.0
Upland scrub-shrub	202.5
Native perennial grassland ^{1/}	69.2
Dwarf shrub-steppe ^{1/}	57.6
Developed/disturbed	4.4
Exotic annual grassland	3.2
Total	1,870.8
^{1/} Listed as a High Priority Habitat or Priority Habitat Feature by the WDFW (WDFW 2018a)	

Ground disturbance, as well as the movement of construction and operation equipment and personnel in the Project area, increases the potential for introduction and spread of noxious weed and invasive species which can alter plant species composition, reduce native plant diversity and abundance, and degrade habitat quality. Construction equipment and activities, as well as storage and dispensing of flammable or combustible materials, have the potential to increase the risk of wildfire, which could result in a loss or alteration of vegetation and habitat types within and adjacent to the Project area. During operation, maintenance activities such as vegetation maintenance and operation of internal combustion vehicles have the potential to increase the risk of wildfire. Operation of the Project facilities, such as the substation, solar modules, and overhead collector lines, also present a potential fire hazard. Additionally, introduction or spread of invasive species, such as cheatgrass, during construction and operation could also increase the risk of

wildfire or alter fire regimes. Fugitive dust generated during construction activities also has the potential to affect vegetation by interfering with photosynthesis and reducing productivity.

With implementation of the BMPs identified in Section 3.3.5 below, the Project is not expected to result in a significant increase in the introduction and spread of noxious weeds and invasive species, risk of wildfire, or fugitive dust.

3.3.4.2 Special-status Plant Species

Project facilities would not be sited within any documented populations of special-status plant species. Therefore, there would be no direct impacts to special-status plant species from construction and operation of the Project. Additionally, erosion and sediment control, noxious weed management, and fire prevention measures (see Section 3.3.5) would avoid or minimize any indirect effects to special-status plant species. If modifications to the current location of Project facilities are required, the Applicant would ensure that the final location of Project infrastructure would avoid directly impacting documented locations of special-status plant species.

3.3.4.3 Wildlife

General Effects Common to All Wildlife

Individuals of some wildlife species may be directly affected by construction activities due to collisions with construction vehicles. Species most susceptible to vehicle-related injury and mortality include those that are inconspicuous (snakes, small mammals), those with limited mobility (invertebrates), burrowing species (mice and voles, toads, snakes), and wildlife with behavioral activity patterns making them vulnerable, such as deer that are more active at dusk and dawn. Construction personnel's adherence to speed limits should minimize the effect for some species, but some limited vehicle-related injury and mortality may occur. Similar effects are anticipated during operation of the facility.

Most wildlife should be able to avoid construction and operation activities, and as a result, would be displaced from habitats that are cleared of vegetation or are adjacent to construction activity. Displacement of wildlife away from the construction activity would result in increased competition for resources with other species in adjacent habitats (WDFW 2009). Noise and human presence would cause wildlife to avoid areas of human activity. Anticipated construction and operational sound levels are discussed in Section 3.1, Noise. In general, sound levels from construction equipment are expected to be approximately 80 to 90 dBA at a distance of 50 feet from the equipment. This sound level could elicit a flee/hide response, cause distraction to normal behaviors, and mask necessary communications between individuals (Francis and Barber 2013). The level of effect depends on the species and distance from the noise source.

Shrub-steppe communities are imperiled because of anthropogenic disturbances. Habitat loss through conversion to agriculture, fire, fragmentation, and degradation are the major threats to wildlife in the state of Washington (WDFW 2009). The long-term conversion or loss of habitat associated with the permanent facilities (roads, photovoltaic arrays, power collection system, and O&M building), would create additional habitat loss and fragmentation on the landscape.

Birds

Habitat loss or modification and displacement of birds from the Project area would be the primary effect on local bird populations. Removal of vegetation during the breeding season can result in destruction of nests and injury or death to birds or eggs. Performing vegetation removal between August 1 and the end of February (Section 3.3.5) would reduce effects on breeding birds.

Other effects to birds, though remote, could include direct mortality from collision with fencing, photovoltaic arrays, and other solar structures (Hernandez et al. 2014; Kagan et al. 2014). If an avian fatality were to occur, it is expected to be primarily within the passerine (songbirds and corvids) taxonomic group because passerines are the most abundant avian group that would be expected to occur at the Project.

Bats

Considering the minimal amount of roosting habitat within the solar facility siting area, potential effects from the Project would mostly be associated with removal of foraging habitat and creation of potential collision risks with Project infrastructure. Currently, there is a lack of experimental observational literature on the effects of photovoltaic solar panels on bats, including the expected level of bat fatalities (Harrison et al. 2016).

Raptor Nests

Four nests identified during surveys for wind facilities (NWC 2008, 2010) occur within the solar facility siting area. Two of the nests were inactive at the time of survey but could have been occupied in subsequent years. The other two nests were occupied by a common raven and Swainson's hawk. Performing vegetation removal activities outside of the primary breeding season for birds would avoid disturbing any breeding activity at nests within and adjacent to the solar facility siting area. However, nest sites that are within areas proposed for disturbance within the solar facility siting area would be lost for the life of the Project, and breeding pairs would be displaced if they return to those sites post-construction.

Other nests that occur outside of the disturbance area could be occupied by raptors during operation of the facility. Depending on the species and proximity of the nest to the disturbance area, some nesting raptors may be affected by reduced prey availability associated with habitat loss, which could reduce foraging success (Bart et al. 2006).

Big Game

Given the relatively small population in the region, there is a low likelihood that the Project would affect reintroduction efforts. If individuals are in the vicinity of construction activities, they would be able to avoid being directly affected because they are highly mobile, they avoid human activity, and there is ample nearby habitat.

Mule deer are likely to occur in the Project area during construction activities. Similar to pronghorn antelope, mule deer would be able to avoid construction activities. Given their higher population densities in the region, there would be more opportunity for collision risks with construction

vehicles. In addition, the perimeter fencing could pose a collision risk, especially if mule deer respond to humans or predators by fleeing toward the fence or attempting to jump over the fence. Of the two perimeter fence designs described in Section 2.2.5.3, the 8-foot-tall fence is typically recommended for excluding mule deer (Wyoming Game and Fish Department 2004; Mule Deer Working Group 2014).

Construction of the Project would affect mule deer through direct habitat loss and habitat fragmentation (Lutz et al. 2011). Fencing around the Project would eliminate forage and cover habitat by excluding mule deer from entering the 1,870-acre fenced area. Development of utility-scale solar facilities is likely to affect mule deer movement and habitat use (AGFD 2010). Habitat fragmentation would occur if established movement corridors for mule deer are eliminated due to fencing. The influence this may have on local populations is unknown due to the lack of knowledge regarding movement corridors within the East Columbia Gorge mule deer management zone. The loss of 1,870 acres of habitat in the 2.9-million-acre management zone accounts for less than one-tenth of one percent of the total management zone. No mule deer priority habitats are affected.

Other Terrestrial Wildlife

Effects on other terrestrial wildlife are addressed above under general effects common to all wildlife.

3.3.4.4 Special-status Wildlife

Effects to special-status wildlife species would be similar to those discussed in Section 3.3.4.3. Generally, disturbance to habitat associated with special-status wildlife (Table 3.3-3) has the potential to adversely affect those species. Performing vegetation removal outside of the primary breeding bird season would avoid or minimize effects on special-status bird species.

A single Townsend's ground squirrel observation (number of individuals unknown) was recorded within the Project area during surveys for adjacent wind facilities (NWC 2008). If ground squirrels are still present, they would likely experience displacement and some mortality.

3.3.5 Mitigation Measures

Mitigation measures and BMPs to avoid and minimize effects to vegetation and wildlife would be implemented during design, construction, and operation of the Project. This section describes mitigation measures and BMPs that would be implemented during each of these phases.

3.3.5.1 Mitigation Measures During Design

The final Project layout would be designed to avoid and minimize impacts on vegetation, wildlife, and special-status species to the extent possible. Avoidance and minimization measures during design of the final Project layout would include the following:

- Construction of new temporary and permanent roads would be designed to avoid sensitive resources.

- Habitat impacts would be minimized to the extent possible through avoidance of higher quality habitat where possible.
- Designing overhead transmission lines in accordance with the recommendations of the Avian Power Line Interaction Committee for avian protection on power lines (Avian Power Line Interaction Committee 2006).
- Stormwater drainage systems would be designed in consultation with a professional engineer to minimize erosion (see Section 3.4).
- Perimeter fencing would be designed to minimize collision risk for wildlife.

3.3.5.2 Mitigation Measures During Construction

Avoidance and minimization measures that would be implemented during construction include the following:

- Construction disturbance would be minimized by flagging the limits of construction; environmental monitoring would be conducted to assure that flagged areas are avoided.
- Sensitive resources, including documented populations of special-status plant species, raptor nest buffers, and drainages and wetlands, would be flagged by a qualified biologist prior to construction and flagged areas would be avoided during construction.
- Environmental training would be developed to provide training for construction personnel on sensitive species, location of no-work areas, environmental specifications, permit requirements, and other environmental issues, and would cover proper protocol for responding to dead or injured wildlife.
- Construction personnel would be required to report any injured or dead wildlife detected while on site to the construction manager.
- To reduce harassment or collision with wildlife, construction personnel would be instructed to maintain appropriate driving speeds and to observe caution while driving through the Project area; speed limits would be posted throughout construction area.
- A fire control plan would be developed and implemented with local fire districts to minimize risk of accidental fire during construction. See Section 3.8, Public Safety and Environmental Health, for additional information on fire protection.
- Road watering and speed limits would be implemented to minimize generation of fugitive dust. See Section 3.2, Air Quality, for additional information on dust management measures.
- An Erosion Prevention and Sediment Control Plan would be developed in accordance with the Project's NPDES permit. See Section 3.4, Wetlands and Water Resources, for additional information on erosion and sediment control measures.
- Vegetation removal activities would be scheduled to occur between August 1 and the end of February to avoid the primary breeding bird season. If vegetation removal is required

between March 1 and August 1, nest surveys (including raptors) would be conducted in the area proposed for disturbance and an applicable buffer of that area. If active nests are found, activities would be avoided around the nest site until birds have fledged. WDFW would be consulted for appropriate buffers for surveys and nest avoidance.

3.3.5.3 Mitigation Measures During Operation and Maintenance

To avoid and minimize adverse effects to vegetation and wildlife during operations and maintenance, the following mitigation measures would be implemented:

- An environmental training program would be implemented to ensure that operation personnel are aware of sensitive biological resources. This would include 1) guidance on how to avoid impacts to existing or future sensitive resources, and 2) a reporting program.
- Operations personnel would be required to report any injured or dead wildlife detected while on site to the appropriate on-site manager during operations.
- A fire control plan would be developed and implemented with local fire districts to minimize risk of accidental fire during long-term operations.
- Traffic speeds on unpaved roads would be limited to 25 miles per hour (mph) to reduce collision risk to wildlife crossing roads.
- The Project will comply with all required permit conditions.
- A Restoration and Weed Management Plan would be developed in consultation with the Klickitat County Weed Control Board; the plan would include measures to monitor for and control infestations of noxious weeds.

3.3.5.4 Site Restoration

Following construction, areas disturbed by construction activities that are not occupied by Project infrastructure would be restored. Restoration would include revegetation with plant species appropriate for operation of the Project. A majority of revegetation would result in modification of habitat to a less diverse, low-growing vegetation community; these areas are considered a permanent impact to habitat for this analysis. A Restoration and Weed Management Plan would be developed in consultation with the Klickitat County Weed Control Board. The plan would include measures designed to ensure successful revegetation, including measures for re-establishing vegetation where appropriate, controlling the establishment or spread of invasive species, weed control, and monitoring.

3.4 Wetlands and Water Resources

This section describes the existing wetlands, surface water, and groundwater resources within the Project study area and includes details about the regional precipitation, watershed, floodplains, water rights, stormwater runoff, and groundwater (including aquifers and critical recharge areas). This section also discusses potential effects of the proposed construction and operation on wetland

and water resources at the Project area as well as how the Project will minimize erosion that could result from construction and operation activities.

3.4.1 Study Methodology

The Project study area was established to encompass the entire 4,513-acre solar facility siting area. Prior to field work, the potential locations of wetlands and other waters were identified using several sources including the National Wetlands Inventory (NWI 2018), Natural Resource Conservation Service Web Soil Survey hydric soils map (NRCS 2018), the U.S. Department of Agriculture's (USDA) Farm Service Agency aerial photographs from 2017 (USDA-FSA AFPO 2017), and the Washington Natural Heritage Program database of high-quality wetlands (Heritage Program 2018).

Stream channels were mapped along their centerline. Streams were delineated based on the presence of a defined channel with bed scour, sediment deposition, or other evidence of regular flow. Several of the streams originated in the wetland study area; these were mapped from the point at which a defined channel with evidence of regular flow was present. Channel widths were determined by estimating the width of the area within the ordinary high water marks. Flow duration for the stream channels was determined using criteria in the Streamflow Duration Assessment Methodology (Nadeau 2015).

Stream channels were classified following the Washington Department of Natural Resources interim water typing system (WAC 222-16-031). Water type classifications are based primarily on fish use and flow regime, as well as other values including water supply use. The classifications were used to determine stream buffer widths.

Wetlands were rated and classified using the Washington State Rating System for Eastern Washington (Hruby 2014). The rating system categorizes wetlands based on specific attributes such as rarity; sensitivity to disturbance; and water quality, hydrologic, and habitat functions. The wetland classifications were used to determine wetland-buffer widths following the criteria in the Klickitat County Critical Areas Ordinance (CAO).

The September 2018 Lund Hill Solar Project Wetland Delineation Report contains additional details on wetland and other waters mapping and delineations (Tetra Tech 2018b).

Information used to describe the affected water resources was obtained from Ecology's databases (Ecology 2018) and from the Water Resources Inventory Area (WRIA) 31 Watershed Management Plan (WRIA 31 Planning Unit 2008).

Potential impacts related to stormwater runoff created by Project were identified by reviewing the proposed placement of Project facilities and through a review of available data from similar projects. The Project would include approximately 59 acres of new impervious area, including gravel roads, concrete pads for the inverters and transformers, a substation, and an O&M building.

3.4.2 Affected Environment

3.4.2.1 Watersheds

The Project is located within WRIA 31, the Rock-Glade Creek Watershed. WRIA 31 is subdivided into four hydrologic subbasins. The four subbasins from east to west are Rock Creek, Wood/Alder Creek, Glade/Fourmile Creek, and Kennewick. The Project would be located in the Wood/Alder Creek subbasin and entirely within the Wood Creek basin.

The entire watershed is arid with a mean annual precipitation decreasing from 16 inches per year in the Rock Creek subbasin on the west to 8 inches per year in the Kennewick subbasin on the east. The majority of the precipitation occurs between October and April with some precipitation occurring as snow. The average precipitation in the Wood Creek basin is 13 inches per year (NOAA 2018).

3.4.2.2 Surface Waters

A total of 22 streams were delineated in the Project study area; of those, six were determined to be intermittent and the remainder were classified as ephemeral. The total area of preliminary jurisdictional other waters within the Project study area boundary is 0.433 acre. The Lund Hill Solar Project Wetland Delineation Report (Tetra Tech 2018b) contains maps and other details of the individual streams.

The Project would not intersect any water bodies and would provide more than the required 25-foot buffer on all delineated streams. A visual representation of the surface water buffers within the Project layout is available in the Delineated Wetlands and Water Mapbook in Appendix A.

3.4.2.3 Water Rights

Washington law requires users of public waters to obtain a water right from the state prior to use of the water, excluding groundwater withdrawals of less than 5,000 gallons per day for specified uses, which are termed “exempt groundwater withdrawals.” Ecology’s Water Resources Explorer database shows the location of the point of diversion or withdrawal for each water right entry to the nearest quarter-quarter section within the township-range-section system. There are 11 water rights claims within the Project area, all sourced from groundwater and used for livestock water.

3.4.2.4 Soil Erosivity

The soils in this region are formed from windblown loess deposits or glacial outburst flood sands and gravels underlain by basaltic bedrock. All soils within the Project study area are silt loams. These soils are well drained and represent a relatively low risk of soil erosion and runoff where there is groundcover. However, heavy rainfall events could increase the potential for runoff and erosion. Therefore, the native soils have medium erosivity. Additional detail on soil types is provided in Section 3.5, Geologic and Flood Hazards.

3.4.2.5 Stormwater

The Project would include approximately 59 acres of new impervious area, including gravel roads, concrete pads for the inverters and transformers, a substation, and an O&M building. Table 3.4-1 presents the total impervious area that would result from construction activities (Ecology 2019).

The Stormwater Management Manual for Eastern Washington (Ecology 2019) defines impervious surfaces as follows:

A hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.

Table 3.4-1 Impervious Surfaces in the Project Study Area

Project Component	Acres
Solar Panel Support Posts ^{1/}	0.32
Cabinet Pads for Inverters and Transformers ^{2/}	0.53
Gravel Roads ^{3/}	42.7
Substation	5
O&M Building, Parking, and Laydown Area	10
Total Impervious Surface	58.6
1/ Assumes 6-inch circular post	
2/ Assumes 30-foot by 15-foot concrete pad	
3/ Assumes 16-foot road width	

3.4.2.6 Wetlands

Thirty wetland areas were delineated within the solar facility siting area. The primary hydrology source for 27 of the wetlands is precipitation, and the remaining 3 were deemed to have groundwater sources. Twenty-five of the 30 Palustrine Emergent and Palustrine Scrub/Shrub wetlands were delineated along riverine wetland corridors and were not identified in the National Wetlands Inventory.

Two of the wetlands are vernal pools with no channelized inflow or outflow, and one is likely a man-made depression with no channelized inflow or outflow. The total area of preliminary jurisdictional wetlands within the Project study area is 5.039 acres.

3.4.2.7 Floodplains

The Federal Emergency Management Agency (FEMA) identifies areas that have a 1 percent chance of being flooded in a given year as 100-year floodplains. The area within the Project boundary is designated by FEMA as “area of minimal flooding.” There are no areas of the 100-year floodplain within the solar facility siting area.

3.4.2.8 Groundwater

Most of the groundwater used in the Columbia Plateau physiographic province comes from layers of basalt collectively known as the Columbia River Basalt Group (CRBG), a complex aquifer system made up of hundreds of individual basalt flows (Reilly, et.al. 2008). Klickitat County, including the Project area is underlain by the Columbia River Plateau Aquifer system. This aquifer system includes the following three separate units (from youngest to oldest): the overburden or alluvium aquifer, consisting of materials overlying the CRBG; a minor amount of sediment interlayered with basalt; and the CRBG, which is the largest and most important hydrologic component of the aquifer (Klickitat County 2004). In order to simplify the description of the area's hydrogeology, the aquifers in the Project vicinity can be grouped into two main hydrologic units: the overburden (i.e., alluvium) and the basalt aquifers (Klickitat County 2004). Static water levels vary greatly because the separate aquifer units all contain water-bearing zones to some degree. The major water-bearing zones are generally in the deeper CRBG. A review of drinking water and monitoring well logs from the surrounding area indicates that static water level depths are usually between 27 and 120 feet below ground surface (Ecology 2018).

Aquifer Recharge Areas

Klickitat County's CAO addresses aquifer recharge areas that have a high susceptibility to aquifer contamination. These areas are designated on the basis of land-use activities that would pose a threat to aquifer quality; land-use activities that pose a threat to community water systems; or aquifers with characteristics conducive to contamination. There are no land use activities in the study area that pose a threat to aquifer quality or community water systems, and the aquifers in the study area have not been identified to have characteristics conducive to contamination. Therefore, according to the definitions provided in Klickitat County's CAO, there are no aquifer recharge areas that have a high susceptibility to contamination. Groundwater within the Project site is mainly used for livestock needs. The population density in this area is low, and as such, the demand on local groundwater resources is low.

Overburden Aquifer

The overburden (i.e., alluvium) in the structural basin of the Columbia River Plateau physiographic province readily transmits water and contains groundwater table aquifers. These aquifers are generally coarse grained and highly permeable within a few feet of the ground surface and fine-grained and less permeable at greater depth. Groundwater in the overburden aquifer moves downward from the anticlinal ridges toward adjacent streams and rivers (such as the Columbia River) in the intervening synclinal basins (Bauer and Hansen 2000). The groundwater-level contours for this aquifer mimic surface topography (Whiteman 1986, Lane and Whiteman 1989, Hansen et al. 1994).

Basalt Aquifer

Groundwater in the CRBG basalts occurs in joints, vesicles, and fractures, as well as in intergranulated pores of the sedimentary interbeds. Interflow zones, which consist of the top of

one basalt flow, the bottom of the overlying flow, and any intervening sediment, if present, generally are permeable where the basalt is vesicular or brecciated. The permeability of interflow zones varies because not all interflow zones are vesicular and brecciated. Between interflow zones, the dense flow interiors are relatively impermeable. Conceptually, then, the CRBG is a series of productive aquifers consisting of permeable interflows separated by less permeable flow interiors (Wells, et.al. 2009).

Water-level data indicate that the flow in basalts is downward except near discharge areas, which are generally located along streams and rivers (Lane and Whiteman 1989). Localized anomalies to this pattern are caused primarily by geologic structures of both known and uncertain nature and secondarily by groundwater pumping and irrigation (Bauer and Hansen 2000).

3.4.2.9 Regulatory Framework

Federal and State

The USACE regulates fill activities in waters of the United States through Section 404 of the Clean Water Act. A Preliminary Jurisdictional Determination (PJD) assumes that all delineated wetlands and streams are jurisdictional. An Approved Jurisdictional Determination (AJD) established which features are and are not jurisdictional. For example, vernal pool wetlands may be considered as isolated wetlands, and therefore, USACE potentially would not regulate them. The AJD is a more time-consuming process for USACE; therefore, developers sometimes opt for the PJD option to save time. If the local USACE representative makes an isolated wetland call, it must be approved by the EPA, which adds additional time to the approval process. All the identified wetlands and waters are presumed to be waters of the United States until the USACE makes final jurisdictional determinations.

Ecology regulates discharges to waters of the state under the state Water Pollution Control Act (Revised Code of Washington [RCW] 90.48); primarily through the use of the state's water quality certification authority. Section 401 of the Clean Water Act provides authority for the state to review Section 404 applications and to certify that proposed projects comply with state water quality standards. All the identified wetlands and waters are presumed to be waters of the state until final jurisdictional determinations are made by Ecology.

Construction projects that disturb one or more acres of land are required to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) for discharge of stormwater during construction. An NPDES permit from Ecology will be required before construction activities begin.

The 1998 Washington State Legislature passed HB 2514, codified into RCW 90.82, to set a framework for addressing the state's water resource and water quality issues, as well as establishing instream flows and addressing salmon habitat needs. Framed around watersheds, or subwatersheds (i.e., WRIAs), this voluntary, comprehensive planning process is designed to allow local citizens, governments, and Tribes to form watershed management planning units to develop watershed management plans. State agencies manage grants, provide technical assistance, and (if

requested) serve on the planning units. The WRIA 31 watershed management plan was adopted pursuant to RCW 90.82 on April 27, 2009.

Klickitat County

Klickitat County has established a CAO pursuant to the Growth Management Act (RCW 36.70A). The Growth Management Act identifies five critical areas: wetlands, critical aquifer recharge areas; frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas. Some of these areas are critical because of the hazard they present to public health and safety (e.g., critical recharge areas, frequently flooded areas, and geologically hazardous areas); others are critical because of the values they represent to the public welfare (e.g., wetland and fish/wildlife habitat protection, control of floodwaters, preservation of water quality, and preservation of open space). Klickitat County also regulates proposed activities that can affect surface waters and wetlands through its CAO.

Stream channels were classified following the WDNR interim water typing system to determine stream and pond buffer widths following the criteria in the Klickitat County CAO. The CAO provides for buffers of 25 to 200 feet in width around fish habitat conservation areas. At the time the CAO was adopted, the WDNR water typing system classified streams as Types 1 through 5. Later revisions changed the typing system to four types with letter codes. All delineated streams were determined to be WDNR Type Ns as non-fish-bearing—seasonal streams that do not meet the criteria for any other stream types. Type Ns is equivalent to Type 5 under the WDNR interim water typing method. The Klickitat County CAO requires a 25-foot buffer around Class 5 waters.

CAO Chapter 3 (Wetlands) regulates activities in wetlands and wetland buffers. Impacts on wetlands or wetland buffers must be addressed in a Wetland Mitigation Plan if the Project will encroach on a wetland or its buffer. A standard 300-foot-wide buffer is required for wetlands larger than 2,500 square feet (0.057 acre) in size. The CAO allows for smaller buffer widths if wetland boundaries are delineated and if wetlands are rated and classified using the Ecology rating system. Buffer widths of 75 to 300 feet are required, based on the wetland classification. Maps of wetlands and the Ecology rating forms are included in the Lund Hill Solar Project Wetland Delineation Report (Tetra Tech 2018b). A mapbook with the delineated wetlands, required wetland buffers, and the Project layout within the Project study area is located in Appendix A.

Section 2.19 (Flood Hazardous Area) of the Klickitat County Zoning Ordinance is intended to “control flood-plain uses such as fill, dumping, storage of materials, structures, buildings, and any other works which acting alone or in combination with other existing or future uses...will cause damaging flood heights and velocities by obstructing flows and reducing valley storage.” In addition to the regulations discussed above, regulations such as the Flood Plain Management Ordinance (RCW 86.16), Klickitat County building codes, and the National Flood Insurance Act may also apply to the Project.

Klickitat County's EOZ ordinance requires that stormwater drainage systems be designed and implemented to minimize erosion.

3.4.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. There would be continued livestock grazing based disturbance of the stream channels or wetlands.

3.4.4 Impacts of the Build Alternative

3.4.4.1 Direct and Indirect Effects on Streams, Wetlands, and Water Resources

The Project would stay outside of the designated wetland and stream channel buffers and is not anticipated to have any effect on either because erosion and sediment control measures would be implemented. There are no anticipated effects on water rights or groundwater. The Project is not likely to pose a threat to aquifer quality or to the domestic water systems within the vicinity of the Project.

The additional 58.5 acres of impervious surface area created by the Project would increase the total amount of stormwater runoff; however, it will likely infiltrate in adjacent farmland and would enter the localized aquifers. The increase in impervious area within the watershed would be negligible and would not affect the overburden aquifer.

Solar panel washing activities are not expected to have any effect on streams or wetlands because of the small amount of water needed. No surfactants will be added for cleaning, and no runoff is anticipated with the use of this cleaning technology.

The possibility of soil erosion throughout the Project area could increase during construction, but is expected to return to benchmark conditions during operations. The potential impact of soil erosion includes soil nutrient loss and the possible degradation of water quality in nearby surface water resources (i.e., sedimentation). The extent of the potential impact depends on the conditions of localized areas susceptible to erosion, including the soil, local terrain, vegetative cover, and the distance from the areas to nearby surface water bodies.

As a result of solar array access road construction, preferential conveyance channels may form near the toe of the roads. These channels could lead to areas of ponding water and scouring effects, which could increase the total amount of sediment transported off site.

The additional impervious area could result in additional stormwater runoff, but would represent a negligible increase in impervious area within the watershed. Construction would comply with all federal, state, and county ordinances, and all construction activities would follow the applicable permits and regulations. An NPDES permit would be obtained from Ecology before construction activities begin.

3.4.4.2 Mitigation Measures

The solar facility siting area was selected to avoid any disturbances to the critical wetlands, streams, and groundwater recharge areas.

- Most Project facilities would be located on higher plateaus away from surface waters which, with implementation of proper erosion controls, would minimize the potential for land-disturbing activities to directly affect surface water resources located at elevations below the plateaus. The solar panel array locations would be located outside stream and wetland buffers to avoid impacts on those waters.
- The Project adheres to the wetland and stream buffer setbacks required in the Klickitat County CAO and would implement an SWPPP that includes BMPs in accordance with the NPDES permit during construction. No mitigation measures are proposed for impacts to wetlands, streams, or water resources because impacts would be avoided.

3.5 Geologic and Flood Hazards

A summary of regional geologic and flood hazards is presented in this section of the report. Geologic hazards may include those resulting from seismic events, landslides, and volcanism. Potential negative effects to human health and the environment resulting from geologic hazards related to the construction and operation of the Project structures are discussed. Possible effects to the environment from construction and operation of the proposed facility are also discussed.

3.5.1 Study Methodology

Geological features near the Project area were ascertained using available geologic maps, studies, and data published for nearby projects. A site visit was not conducted to verify site features or otherwise identify other geologic hazards.

Potential effects to the Project from geologic features were evaluated. Mitigation measures are identified where appropriate.

3.5.2 Affected Environment

The Project location is in the eastern part of rural Klickitat County, Washington. The Project would disturb approximately 1,871 acres located within a 4,513-acre solar facility siting area within the county's EOZ. Land ownership in the solar facility siting area consists of privately owned land and land owned by the state of Washington.

3.5.2.1 Topography

The topography in the solar facility siting area consists of gently sloping plateaus with incised streams that flow southerly to the Columbia River. The Project area is located on a plateau that lies above the Columbia River, with elevations ranging from approximately 1,700 to 2,400 feet above mean sea level (USGS 2017a,b). The lowermost elevations are in the stream canyons at the

southern end of the Project area. The typical ground surface slope across the site is generally 5 percent or less, with much steeper areas in the canyon walls outside of the solar facility siting area.

3.5.2.2 Geology

The solar facility siting area is located within the Columbia Plateau physiographic province. This province is dominated by volcanic materials and covers more than 60,000 square miles in Washington, Oregon, and Idaho (Orr and Orr 1999).

Literature and maps describing regional geology indicate that near-surface materials in the area are unconsolidated wind-blown sediments. These are underlain by the Columbia River Basalt Group (Bela 1982). This basalt originated from vents in southeastern Washington, central and northeastern Oregon, and western Idaho (Beeson et al. 1989). The Pomona Member of the Saddle Mountain Basalt underlies nearly the entire Project site (Bela 1982). This basalt flow is approximately 100 feet thick and approximately 12 million years old (Schuster 1994).

The Columbia River Plateau is predominantly capped by wind-deposited silt and silt (loess). These deposits may be upwards of 30 feet thick near the Columbia River but thinning to less than 3 feet thick in upland areas away from the river (Bela 1982).

3.5.2.3 Soils

The USDA National Resources Conservation Service (NRCS) Web Soil Survey was used to identify and evaluate soils at the Project area. Several soils are present, but three dominate the area: Morrow silt loam, Mikkalo silt loam, and Mikkalo-Bakeoven Complex. These three soils account for approximately 65 percent of the soil in the solar facility siting area. Morrow-Bakeoven complex and Bakeoven very cobbly loam soils account for another approximately 21 percent of the area (NRCS 2018). A description of each of these soils follows:

- Morrow silt loam (21 percent of the solar facility siting area): Well drained; typical profile is silt loam to 38 inches then unweathered bedrock; no frequency of flooding and ponding; moderate to high capacity to transmit water; non-hydric, forms on plateaus with loess as the parent material.
- Bakeoven very cobbly loam (13 percent of the solar facility siting area): Well drained; typical profile is very cobbly loam to 4 inches, very gravelly loam from 4 to 10 inches, then unweathered bedrock; no frequency of flooding and ponding; moderately high capacity to transmit water; non-hydric, forms on plateaus with basalt and loess as the parent materials.
- Mikkalo silt loam (25 percent of the solar facility siting area): Well drained; typical profile is silt loam to 38 inches then unweathered bedrock; no frequency of flooding and ponding; moderately high to high capacity to transmit water; non-hydric, forms on plateaus with loess overlying basalt as the parent material.
- Morrow-Bakeoven complex (8 percent of the solar facility siting area): Well drained; typical profile is silt loam to 38 inches then unweathered bedrock; no frequency of flooding and

ponding; moderately high to high capacity to transmit water; non-hydric, forms on plateaus with loess overlying basalt as the parent material.

- Mikkalo-Bakeoven complex (19 percent of the solar facility siting area): Well drained; typical profile is silt loam to 38 inches then unweathered bedrock; no frequency of flooding and ponding; moderately high to high capacity to transmit water; non-hydric, forms on plateaus with loess overlying basalt as the parent material.
- Oxy silt loam (2 percent of the solar facility siting area): Well drained; typical profile is silt loam to 7 inches deep, gravelly silt loam to 21 inches, then unweathered bedrock; no frequency of ponding, but the flooding frequency is occasional; moderately high capacity to transmit water; non-hydric, forms on flood plains along narrow drainageways with alluvium derived from loess as the parent material (NRCS 2009).

Two of the predominant soil types listed above (Morrow silt loam and Mikkalo silt loam) form on slopes ranging up to 5 percent. The soils consisting of Bakeoven cobbly loam and complexes that include the Bakeoven soils are found on slopes ranging up to 15 percent. The proposed design avoids placing the arrays on steep slopes of canyon walls or in the bottom of the canyons.

The soil types listed above account for approximately 88 percent of the Project area, as estimated by the NRCS soil web-based mapping application. The other 12 percent of soils listed includes rock outcrops and several other soil types that individually cover a small area.

3.5.2.4 Geologic Hazards

Geologic hazards that might be present at or affect the Project area include hazards associated with volcanic activity, landslides and slope instability, earthquakes from seismic activity, or potential flood hazards. These are discussed in the following sections.

3.5.2.5 Volcanic Activity

Several potentially active volcanoes are present in the Cascade Range in central-western Washington, Oregon, and northern California. Eruptions from these volcanoes have the potential to cause damage through lava flows, mud flows, ash falls, and the ejection of pyroclastic materials.

Four Cascade Range volcanoes are within 100 miles of the solar facility siting area: Mount Adams, Mount St. Helens, Mount Rainier, and Mount Hood. The USGS National Volcanic Threat Assessment program rates the threat from these four volcanoes as High or Very High (Ewart et. al. 2018). Mount Adams is the closest of these, approximately 65 miles west-northwest of the Project area. Historically, eruptions at Mount Adams have generally not been as explosive as other Cascade Range volcanoes. The dominant type of eruption has been the type to produce lava flows.

The greatest potential hazards from Mount Adams would be from avalanches of debris, landslides, and flows of a mixture of water and volcanic debris known as lahars. Mount Adams may be particularly susceptible to this latter type of hazard because of the ice and snow fields that are present on its flanks much of the year. Significant landslides and lahars may occur without an eruption.

The Lund Hill solar facility siting area is outside of the area that can reasonably be expected to be affected by the more destructive volcanic hazards, including lava flows, pyroclasts, and lahars. The main hazard from volcanic activity to the Project area is from ash-sized tephra that is ejected and carried downwind and settles on the ground. Estimates of the annual probability of tephra accumulation in the areas potentially affected by Mount Adams were reviewed. The solar facility siting area is in a zone estimated to have a 0.1 to 0.2 percent annual probability of receiving a 1 centimeter or more accumulation of tephra. The estimated probability is between 0.02 and 0.1 percent for an accumulation of 10 centimeters or more (Scott et. al. 1995).

3.5.2.6 Landslides and Slope Instability

Information from the WDNR Geological Information Portal's compiled inventory of mapped landslides in Washington state was used to ascertain the presence of known landslides within the Project area. The inventory may not be complete and does not represent an effort to map all areas of the state for historic landslides. It is used here as an indication of the potential for landslides within the landforms and soil types found in the Project area.

A map of the inventoried landslides shows that numerous landslides have occurred in the vicinity, primarily to the south of the solar facility siting area in the stream canyons near the Columbia River. Some of these landslides have been mapped within the lease boundary along or within Big Horn Canyon near the eastern boundary. No landslides have been mapped within the solar facility siting area (WDNR 2018b). Nonetheless, the mapped landslides in the area show that the potential exists on steeper slopes in this geomorphologic setting. It is unlikely that landslides have occurred within the solar facility siting area because slopes greater than approximately 8 percent have been avoided.

However, landslides may occur during the lifecycle of the Project. Based on the areas of mapped slides and the overall topography of the Project area, the areas at the top of, or within, the canyon walls are most susceptible. The solar arrays will be located on the uplands away from the walls and edges of the canyon where landslides are most likely to occur.

3.5.2.7 Seismic Activity

The Cascadia subduction zone is located off the Pacific Coast, extending from British Columbia to northern California. This is a convergent plate boundary where crustal plates beneath the Pacific Ocean subduct or slide under the North American Plate due to relative motions between them. This is a geologically dynamic process with the potential for seismic events that could cause ground motion at the Project area. Forces in the North American Plate could cause movement along faults in central Washington that might also affect the Project area.

Information from WDNR was used to evaluate potential sources of seismic activity in the area including known faults and earthquake hypocenters (Czajkowski and Bowman 2014). The study divided the state into several regions. Klickitat County is in the subprovince designated as the Yakima Fold and Thrust Belt. This province is named after a feature that is expressed as a series of east-west trending topographical folds or anticlinal ridges in south-central Washington. The origin of this folding is compression of the crust caused by one block to the south being rotated into the block to the north of it (McCaffrey et. al. 2016).

Several faults have been mapped in the Yakima Fold and Thrust Belt that are within several miles of the Project area. The Columbia Hills Fault Zone, USGS Fault No. 568, has been mapped on the north side of the Columbia River. It is present approximately 3.5 miles south of the Project area, near the southern boundary of the solar facility siting area. This fault has been active within the Quaternary Period, possibly within the early Holocene Epoch (Last et. al. 2012).

The Washington Geologic Information Portal (WDNR 2018b) lists this fault on the database of seismogenic faults (those capable of producing earthquakes). The Geologic Information Portal indicates that this is a normal fault, with a slip rate of less than 0.2 millimeters per year, and that the fault includes both visible and hidden traces. It is a Class B fault, meaning it likely of Quaternary age; however, there is insufficient information on whether it extends deep enough to be a potential source of significant earthquakes.

The Czajkowski and Bowman map shows another fault in the area, the Arlington-Shutler Butte Fault approximately 6 miles southwest of the solar facility siting area. This fault was estimated to be last active in the middle to late Pleistocene Epoch, or possibly about 100,000 years before present (Czajkowski and Bowman 2014).

According to the Washington Geologic Information Portal database, the Arlington-Shutler Butte Fault is a strike-slip fault, with a slip rate of less than 0.2 millimeters per year (WDNR 2018b). The USGS indicates that this is a Class A fault (a Quaternary fault of tectonic origin) with both right-lateral strike slip and normal movement (Personius and Lidke 2003).

Earthquake hypocenters are located near the solar facility siting area according to the Czajkowski and Bowman map. The designation on their map was divided into two categories: those with a magnitude from 2 to 3 on the Richter Scale, and those with a magnitude from 3 to 6.8. Three hypocenters for earthquakes in the larger category are located within or near the boundaries of the solar facility siting area. Two hypocenters for the smaller category are located within the boundary of this area. None of the hypocenters are shown within the Project area.

This information is similar to that contained in the Washington Geologic Information Portal database of earthquakes with a magnitude of greater than 1, which shows that four earthquakes may have been centered in the solar facility siting area with dates ranging from 1988 to 1997 and magnitudes ranging up to 3.5 (WDNR 2018b). None of the hypocenters shown on the WDNR portal are within the Project area.

Potential ground motion in the area was extrapolated from information shown on a map published by the Oregon Department of Geology and Mineral Resources (Madin and Mabey 1996), which was derived from work conducted by Geomatrix for the Oregon Department of Transportation. Three estimates for maximum earthquake shaking were given:

- Once in every 500 years occurrence (10 percent chance of happening every 50 years);
- Once in 1,000-year occurrence (5 percent chance every 50 years); and
- Once in 2,500-year occurrence (2 percent chance every 50 years)

The ground motion on these maps is defined as peak ground acceleration expressed as a percentage of gravity. The estimated values for the three occurrences listed above are 8 percent, 14 percent, and 22 percent. The highest of these values might cause extensive damage in poorly built structures and slight to moderate damage in ordinary structures.

The National Earthquake Hazard Reduction Program uses a classification system that assigns designations to soil types and locations based on expected potential for strong shaking in an earthquake. A map for Klickitat County showing the various site classes was reviewed (Palmer et al. 2004a). Most of the solar facility siting area is shown as Site Class B, which means that earthquake shaking is neither amplified nor reduced by the near-surface geology. A small portion of the solar facility siting area, estimated to be less than 10 percent, is shown as Site Class D, which represents increased amplification of ground shaking.

Liquefaction of soil is another hazard associated with earthquake shaking. During this process, soil loses its strength and behaves like water-saturated sand. In an evaluation of the liquefaction potential in the solar facility siting area, the potential is considered non-existent in possibly 90 percent or more of the Project area because of the presence of shallow bedrock. The remaining portions have a low susceptibility for liquefaction (Palmer et al. 2004b).

3.5.2.8 Flooding Hazards

Flooding hazards in the Project area appear to be minimal. A Flood Insurance Rate Map from the FEMA, National Flood Insurance Program was used to form this opinion. All of the Project area and nearly all of the solar facility siting area are in Zone C, which is the designation for areas with minimal flooding. Some of the canyon bottom along Pine Creek is designated as Zone A (FEMA 1981). This designation is for areas within what is commonly referred to as the 100-year flood plan. They have a 1 percent annual chance of being affected by a flood event. This is an approximation because detailed or site-specific analyses have not been performed, and thus, base flood elevations or flood depths are not shown on the map.

3.5.3 Impacts of the No Build Alternative

There would be no effects to the landscape, soils, or geology under the No Build Alternative because the Project would not be built and the area would remain in its current state.

3.5.4 Impacts of the Project

Project impacts to the environment and to human safety, from a soils and geology perspective, have been considered and are discussed below.

3.5.4.1 Environmental Impacts

The primary effect to the area's geology and soil resources would be the disturbance and covering of the surface soils. Placement of the solar modules, tracking systems, and electrical infrastructure would necessitate disturbing the soil throughout the Project area during the construction period. This may include removing or otherwise disturbing the vegetative cover. The potential for soil

erosion or slope instability is minimal because slopes of greater than approximately 8 percent are being avoided.

Vehicle traffic accessing the construction areas during the installation of the arrays may also increase the likelihood that erosion may occur. Again, this is more likely where there are steeper slopes. Ruts left by vehicle tires on sloped areas tend to create preferential channels for water flow during heavy precipitation events. The soil types present (mostly unconsolidated silt) tend to erode during rainfall and run off on slopes if vegetation has been removed or disturbed to the extent that stable root structures are no longer present. However, the area will be revegetated following construction.

Because the construction of roads would be engineered and subject to an erosion-control plan, it is likely that the Project components would be constructed with more protections against erosion than existing farm roads and pastures in the Project vicinity. Because of the relatively flat topography that underlies Project facilities, deep cuts or substantial fill construction are not anticipated for the facility infrastructure. However, as described previously, the native basalt rock is generally stable. Isolated areas that may include thicker overburden soils would be more susceptible to localized slope failures if excavations are cut steeply and would erode more quickly during stormwater runoff. The potential for erosion would be minimized by implementation of the Project's NPDES permit (see Section 3.4, Wetlands and Water Resources).

The potential for earthquakes and volcanic events described above would not increase or be otherwise affected by the Project. The surface disturbances from the installation, operation, and maintenance of the solar arrays would not affect the geologic processes that drive seismic activity and volcanism. Damage to the arrays and infrastructure associated with the Project could occur because of natural events, but the Project would not cause or precipitate these events, nor would it increase the risk to surrounding areas from naturally occurring geologic events. While transformers contain oil, they are designed with secondary containment in accordance with the SPCC. The structures do not contain significant quantities of hazardous materials, so if damage were to occur as a result of an earthquake or volcanic event, there would be no resultant environmental damage.

A 100-year flood plain is present in a portion of lease boundary but not in the solar facility siting area or the Project area. The Project would not affect the likelihood that flooding may occur along Pine Creek where the Zone A designation is located.

3.5.4.2 Human Health Impacts

Human safety can be compromised during seismic events by collapsing building or structures. As discussed above, there is potential for earthquakes at the Project area, but the probability of a seismic event powerful enough to cause destructive structural damage is low. The Project may include a new O&M building. If a new building is constructed, it will meet the code requirements for seismic events. The low probability of seismic events and the building codes that would be followed mean that the probability that human safety would be endangered by a building collapse in the Project area during a seismic event is remote.

Workers would be at the Project area during construction and then periodically during the lifespan for maintenance activities. The solar modules and electrical facilities that would comprise the infrastructure for the Project have a low chance of collapse during the scale of seismic event that may be expected for this part of Washington state.

The bottom of the Pine Creek canyon is the only area within the lease boundary identified by FEMA as being in a 100-year flood plain. This is not within the solar facility siting area, however, so the Project infrastructure would not be located in the flood plain. Workers constructing or maintaining the solar equipment would not be endangered by potential flooding.

Volcanic events could affect the Project area through ash fall. The May 1980 eruption of Mount St. Helens produced ash fall levels of between 1 and 2 inches thick at many places in central Washington state (Sarna-Wojcicki et. al. 1981). This can be used as a reasonable estimate of the ash that might fall on the Project area during a major eruption of Mount Adams or Mount St. Helens. This should not cause a life-threatening situation for workers installing or maintaining the equipment.

Human health hazards because of soil failure, including soil liquefaction during seismic events or landslides, are also considered low. Construction of the Project would not require deep excavations, nor would it require work along the edges of the stream canyons in the area.

3.5.5 Mitigation Measures

Potential geologic and flood hazards from the construction and maintenance/operation of the proposed solar facility can be minimized through avoidance and mitigation. These include the following:

- **Design and Construction Standards:** The Project would be designed to meet or exceed construction standards developed by the International Code Council and contained within the International Building Code. Chapter 16 of the International Building Code, Sections 1614 and 1615, Earthquake Loads and Site Ground Motion, include structural standards that address the geologic hazards that may be associated with the Project area.
- **Structure Placement:** The Project would be sited to avoid steep slopes, such as those along the canyon walls. Construction on stable ground away from the slopes would lessen the potential environmental impacts of the project and will address human safety concerns posed by landslides for unstable soils on slopes.
- **BMPs:** BMPs for erosion control would be developed and implemented through the Erosion and Sediment Control Plan required as part of the NPDES permit. These BMPs would prevent or minimize erosion or soil movement during road building and facility construction. A reseeding and restoration plan would be prepared in accordance with Klickitat County EOZ requirements so that plant roots can be established as soon as practicable after construction to provide ongoing erosion control.

3.6 Cultural Resources

This section describes the potential impacts on cultural resources from construction and operation of the Project. It summarizes findings of the cultural resource assessment, conducted by PaleoWest Archaeology (PaleoWest) on behalf of Avangrid (Tennyson et al. 2018), in the cultural resources study area. For the purposes of this analysis, the cultural resources study area is equivalent to the solar facility siting area. Mitigation measures are identified, where appropriate, to reduce or avoid potential impacts.

3.6.1 Study Methodology

The cultural resource assessment included a file search via the Washington State Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Database (WISAARD). Additional sources of information that were reviewed included the National Register of Historic Places (NRHP), Washington Heritage Register (WHR), and historic maps.

PaleoWest sent a letter to the Yakama Nation Cultural Resources Program to inform them of the Project and solicit their input. To date, no response has been received by PaleoWest. However, the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) did provide a scoping comment letter, dated November 27, 2018, to Klickitat County. The letter noted 1) the Yakama Nation's opposition to projects that exclude public lands from tribal access; 2) the Project's proximity to Traditional Cultural Properties (TCPs) and archaeological resources; and 3) the need for a full cultural resources survey. Much of the Project is limited to private lands where access is already restricted. Avangrid has reached out to Yakama Nation to address tribal access concerns regarding portions of the Project that may be located on WDNR lands. As noted above and detailed below, PaleoWest has completed a cultural resources survey of the entire solar facility siting area. Avangrid is aware of TCPs in the region based on their work (under the former name of Iberdrola Renewables) on the nearby Lund Hill Wind Farm (not constructed) location where Avangrid worked with the Yakama Nation to produce a TCP study (Camuso and Rau 2012) for that project. Avangrid used the study results to site the Project away from the TCPs identified therein. However, the company continues to reach out to the Yakama Nation to confirm that impacts to TCPs and other traditional resources are avoided. As appropriate, Klickitat County and Avangrid will continue consultation with the Yakama Nation to identify and resolve potential impacts on these resources by the Project.

The cultural and environmental background and history of the Project vicinity were researched by PaleoWest to provide an interpretive context for cultural resources potentially present in the Project area. The pedestrian inventory (i.e., survey) of the solar facility siting area covered all 4,514.75 acres (Figure 3.6-1).

3.6.1.1 DAHP File Search

On August 4, 2018, PaleoWest conducted a records search of DAHP's WISAARD to identify previously recorded cultural resources and cultural resources inventories in the Project vicinity. This search provided basic information on the types and frequency distributions of cultural

resources present or expected to be present in the Project study area; it also provided cultural context information.

Previous Cultural Resource Assessments

The file search at DAHP identified several previous cultural resources inventories that had been conducted within the vicinity of the Project study area, 10 of which intersected with the study area. These are summarized in Table 3.6-1.

Table 3.6-1. Previous Cultural Resources Studies in the Project Study Area

Report No.	Date	Author(s)	Title
1340569	2001	Ozbun, T., M. Goodwin, R. Kent, and J. Fagan	<i>Cultural Resources Survey and Archaeological Evaluation for the Northwest Pipeline Corporation Protection Project at Wood Gulch Creek Crossing, Klickitat County</i>
1344413	2005	Sharpe, J., J. Bard, R. Ballantyne, and R. McClintock	<i>Archaeological Survey Report Big Horn Wind Project, Bickleton, Washington</i>
1352556	2008	Falkner, M., and B. Bowden	<i>Cultural Resource Inventory and Assessment for the Miller Ranch Wind Generation Project, Klickitat County</i>
1681464	2010	DeJoseph, D. and C. Knutson	<i>Addendum Report No.2 Cultural Resource Inventory and Assessment for the Miller Ranch Wind Energy Project, Klickitat County, Washington</i>
1681399	2010	DeJoseph, D. and C. Knutson	<i>Cultural Resource Inventory and Assessment for the Miller Ranch Wind Energy Project, Addendum Report No.1, Klickitat County, Washington</i>
1680108	2010	Lloyd-Jones, J., S. Davis, J. Held, and T. Ozbun	<i>Cultural Resource Survey of the Northwest Pipeline GP Blue Bridge Pipeline Project, Lewis, Clark, Skamania, Klickitat, and Benton Counties, Washington</i>
1680504	2011	McClintock, R., J. Wilt, and B. Diveley	<i>Shovel Testing at Ephemeral Stream Crossings within Two Wind Power Projects in Klickitat County, Washington</i>
1686770	2015	Woody, D.	<i>Cultural Resources Identification Survey of the Dave Whitmore 2015 NRCS EQIP Project. NRCS EQIP Contract # 740546150LE</i>
1686745	2015	Woody, D.	<i>Cultural Resources Identification Survey of the Neal Slater 2015 NRCS EQIP Project. NRCS EQIP Contract #740546150ML</i>
1689717	2017	Sharley, A. and F. Hamilton	<i>Cultural Resources Assessment of the Proposed HW Hill Renewable Natural Gas Expansion Project, Klickitat County, Washington</i>

Previously Documented Cultural Resources

The records search results indicated that 26 cultural resources have been previously recorded within the cultural resource study area, including four isolates and 22 sites (Table 3.6-2). Of these sites, 20 are historic sites related to either homesteading or livestock control, and the remaining two are pre-contact (lithic scatters). Table 3.6-2 lists these previously recorded resources within the study area.

Table 3.6-2. Previous Cultural Resources in the Solar Facility Siting Area

Trinomial	Period	Site Type	Location in Relation to Solar Facility Siting Area
45-KL-00549	Historic	Debris scatter/concentration; cairn/rock feature	Solar facility siting area
45-KL-00740	Historic	Homestead	Solar facility siting area
45-KL-01312	Historic	Cairn/rock feature	Solar facility siting area
45-KL-01313	Historic	Cairn/rock feature	Solar facility siting area
45-KL-01314	Historic	Objects	Project area
45-KL-01325	Historic	Cairn/rock feature	Solar facility siting area
45-KL-01327	Historic	Homestead	Solar facility siting area
45-KL-01332	Historic	Objects; structure	Project area
45-KL-01333	Historic	Debris scatter/concentration	Solar facility siting area
45-KL-01339	Historic	Debris scatter/concentration	Project area
45-KL-01351	Historic	Debris scatter/concentration	Solar facility siting area
45-KL-01356	Historic	Debris scatter/concentration	Solar facility siting area
45-KL-01357	Pre-contact	Isolate	Solar facility siting area
45-KL-01376	Historic	Debris scatter/concentration	Project area
45-KL-01377	Historic	Debris scatter/concentration	Project area
45-KL-01484	Historic	Cairn/rock feature	Solar facility siting area
45-KL-01485	Historic	Object; debris scatter/ concentration	Solar facility siting area
45-KL-01891	Historic	Debris scatter/concentration	Solar facility siting area
45-KL-01892	Historic	Agricultural property	Solar facility siting area
45-KL-01893	Historic	Object	Solar facility siting area
45-KL-01894	Historic	Isolate	Solar facility siting area
45-KL-01901	Historic	Debris scatter/concentration; structure	Solar facility siting area
45-KL-01903	Historic	Isolate	Solar facility siting area
45-KL-01904	Pre-contact	Lithic scatter	Solar facility siting area
45-KL-01905	Historic	Isolate	Solar facility siting area
45-KL-01907	Pre-contact	Lithic scatter	Solar facility siting area

Pedestrian Inventory

PaleoWest conducted a pedestrian cultural resources inventory of the Project study area on August 1 through 8 and August 15 through 22, 2018. Ground surface visibility was poor to moderate, ranging from 5 to 50 percent. The ground was partially obscured by grasses, forbs, and bushes. The survey area included a total of 4,515 acres and covered the entirety of the solar facility siting area.

The survey was conducted in two phases: an initial identification stage that found isolates and noted the location of potential or previously recorded sites, and a recording phase that fully documented the sites. During the initial phase, archaeologists walked parallel transects spaced 30 meters apart. Sites were generally recorded the day they were discovered, sometimes leading into the following day if not completed on the first day. Field methods included gathering spatial data (e.g., site datums and boundaries) using a Trimble TDC100 with an accuracy within 5 meters and processing in the ArcGIS Collector application.

PaleoWest did not employ subsurface testing during the field survey. Prior research into the geology and soil formation of the survey area demonstrated low probability of buried deposits, thus limiting the usefulness of subsurface investigations. The solar facility siting area is situated on a Miocene-aged lava flow (Schuster et al. 1997) that was subsequently dissected by south-trending drainage systems flowing to the Columbia River. The resulting plateau is relatively flat and slopes slightly toward the south. It is flanked by deep drainages to the east and west and is cut off from alluvial sources. Most shallow drainages on the surface of the plateau, where sediment may accumulate, were removed from the solar facility siting area during design planning. According to the USDA's NRCS Web Soil Survey database (Soil Survey Staff 2018), soils in the solar facility siting area are residuum derived from weathered basalt and loess deposits, most of which were deposited during the Pleistocene. Rock outcrops and shallow soils are present near the upland margins where erosion is most active. The relatively low level of active deposition throughout the Holocene and prehistoric period indicates a low potential for deeply buried sites in this area. Mixing of surface sediments through bioturbation and sheet wash may lead to burial of some artifacts; however, most larger sites likely have some kind of surface expression. Overall, there is potential for the burial of prehistoric materials; however, these remains are likely near surface (Tennyson et al. 2018).

3.6.2 Affected Environment

The cultural settings of the Project are described below. The text is adapted from the pedestrian survey report written for the Project by PaleoWest (Tennyson et al. 2018).

The Project study area is in the Southern Plateau subdivision of the Columbia Plateau, bounded by the Okanogan Highlands to the north, the Bitterroot mountains to the east, the uplands of the Deschutes and John Day rivers to the south, and the Cascade Mountain Range to the west. Specifically, the survey area is in the southwest subsection of the southern Plateau. The pre-contact cultural sequence of this area has been divided into three temporal periods by Ames et al. (1998) and is summarized below, followed by a discussion of the ethnographic and historic periods and the results of the pedestrian inventory.

3.6.2.1 Pre-Contact Setting

Period I can be divided into two sub-periods: Period IA (pre-11,000 years before present [BP]) and Period IB (11,000 – 7000 BP). Early settlers of the Plateau region during Period IA likely entered via a terrestrial route through Canada. Another wave of maritime populations entered from the west using a coastal migration route. The terrestrial population is represented in the archaeological record by Clovis projectile points and inferred megafauna hunting. The maritime population is represented in the record by Western Stemmed points and an inferred broad-spectrum hunting and gathering economy. Period IB provides more substantial evidence of human occupation in the Plateau region than during Period IA. The population is believed to have been highly mobile hunter-gatherers that subsisted on large and small mammals, salmon and other fish, shellfish, birds, and other resources. Small and sparse lithic debitage concentrations indicate short-term occupations by small groups during this period.

During the mid-Holocene, the eruption of Mt. Mazama in 7630 BP may have re-shaped the population distribution of the Pacific Northwest region and preceded Period II (ca. 7000 – 3900 BP). One hallmark of this period is the introduction of Great Basin-style projectile points to the Plateau, possibly due to Plateau populations seeking refuge in the Great Basin from the effects of the Mt. Mazama eruption and eventually returning with Great Basin technologies. Alternatively, the Plateau may have been abandoned and Great Basin populations may have subsequently migrated into the area.

The last period of the pre-contact cultural sequence, Period III (3900 – 1700 BP), corresponds with overall climate cooling in North America around 4,000 years ago. The changing environment and habitats are represented in the archaeological assemblages of this time period. Salmon dominates faunal assemblages, but deer, elk, bison, and sheep are also found. Plateau inhabitants also increased their dependence on upland root resources, such as camas (*Camassia quamash*). The land use pattern established during this period includes the occupation of semi-permanent winter villages with pithouses and the exploitation of upland resources in dispersed temporary camps during the summer and autumn seasons. The importance of long-distance trade with the Great Basin and the coast is evident by the presence of exotic toolstone (e.g., obsidian) and shell beads from the coast. Most residential sites during Period III have been found in lowland areas near streams. The current Project study area is in an upland setting that is considered to have a lower sensitivity for pre-contact archaeological resources. These areas were generally occupied in only a temporary and transitory fashion.

3.6.2.2 Ethnographic Setting

Prior to Euro-American establishment in the region, boundaries between different Native American tribal groups were fluid, and neighboring groups often shared traditional hunting, fishing, or gathering territory. The solar facility siting area was traditionally used by members of the Yakama and Western Columbia River Sahaptin people. Generally, the Yakama used the area north of the Columbia River and the Western Columbia River Sahaptin used the area to the south, but the river was not a fixed boundary. Individuals were associated with a politically autonomous village, and there was no unifying political hierarchy with which they identified. Resource areas were shared among the Yakama, Umatilla, and other Sahaptin-speaking groups (Hunn and French 1998:379). The Yakama spoke a dialect of Northwest Sahaptin and the Western Columbia River Sahaptin spoke a Columbia River dialect; dialectical differences existed between groups but there was a high degree of mutual intelligibility (Schuster 1998:327). Modern categorizations of descendants of these groups are based on reservation assignment and do not accurately reflect pre-contact self-identification (Schuster 1998:327).

Both the Yakama and Western Columbia Sahaptin engaged in a similar seasonal round, based on a semi-permanent winter village. Residents occupied the winter village until the snow melted, usually late February or early March. Family groups traveled to resource areas producing *Lomatium* roots, camas, bitterroot, and wild carrots. These resources were either eaten immediately or processed for long-term storage. The berry harvests were in June followed by salmon runs beginning in July. During the hottest summer months, family groups headed to the cooler mountain elevations. Women and children gathered roots and berries while men hunted. Another salmon run in fall

brought people back to the Columbia River, and they began preparations for the long winter (Hunn and French 1998:380; Schuster 1998:331–333). Permanent villages located near the survey area included *ta'pacnkait*, a Yakama village where Bickleton was later established that included Wayampam and Umatilla inhabitants in 1850, and *k'amitp*^u, an Umatilla village at the confluence of Rock Creek with the Columbia River. Additionally, there was a temporary camp, *ta'ksasam*, used by the Umatilla near the present site of Roosevelt (Ray 1936:119, 148, 151).

The introduction of European diseases occurred prior to sustained contact with Euro-Americans themselves. Epidemics of smallpox in 1780 and 1801 decimated much of the population of the Plateau (Hunn and French 1998:389). Measles and other diseases contributed to population attrition. Another devastating smallpox epidemic in 1853 and 1854 created a swift depopulation of the Plateau and, subsequently, allowed for a rapid expansion of Euro-American colonization of these areas.

The first governor of Washington Territory, Isaac Stevens, signed several treaties in 1855 with representatives of the tribes of eastern Oregon and Washington. These treaties established the Warm Springs Reservation in Oregon and the Yakama Reservation in Washington.

Kavanaugh (1990) interviewed elders from the Yakama Indian Reservation. Informant Howard Jim identified the areas east of the Roosevelt Landfill, southeast of the solar facility siting area, as important lands used for camping, root gathering, hunting, horse grazing, burial, and vision quests. Pine Creek, to the east of the solar facility siting area, is still used by members of the Pine Creek band to gather traditional resources and bury their dead in an established cemetery (Larson and Lewarch 1990:16).

3.6.2.3 Historical Setting

Recorded European exploration of the Pacific Northwest Coast began in the 1540s with Spanish explorers, followed by Russian, English, and American fur traders, but there was little interest in landfall. While various explorers, including Captain James Cook, mapped the coast, all missed the 8-mile-wide mouth of the Columbia River until 1792 when American Robert Gray surveyed and mapped the coast (Kuhlken 2003:14). The interior of eastern Washington was first described by Europeans during the Lewis and Clark Expedition of 1804–1806. The first permanent Euro-American presence in the region was the Hudson's Bay Company trading post, established at the mouth of the Walla Walla River. In 1838, the Wascopam Methodist Mission was established near The Dalles, operating until 1847 (Kuhlken 2003:16).

The establishment of the Oregon Trail in the 1840s brought a great migration of settlers to the Oregon (and later Washington) Territory, creating conflict with and greatly disrupting the lives of the Native American populations of the area. As noted above, Isaac Stevens signed a series of treaties in 1855, relocating local Native Americans to various reservations. Not all members of the signing tribes were willing to abide by treaty conditions, resulting in the so-called Indian Wars of 1855–1858. Washington Territory was technically closed to Euro-American settlement during this period, but military orders were not sufficient to deter settlement. By 1858, the lands east of the Cascades, including Klickitat County, were officially opened for Euro-American settlement (Ballou 1938). Settlement was slow, and Ballou (1938) notes that the Native American population of Klickitat County long outnumbered Euro-

Americans until the early twentieth century. The earliest non-Native American settlement in Klickitat County was the Erastus S. Joslyn farm near present-day White Salmon. The Joslyn family built a cabin, cultivated a garden and orchard, and grazed cattle circa 1852. Many settlers, mostly soldiers and fur trappers, came to the region from the Willamette Valley in Oregon. By 1860, 15 Euro-American families had settled in the area. Klickitat County was incorporated in 1859 under the spelling “Clickitat,” which was changed to the current spelling in 1869.

Early settlers raised cattle that were often sold to supply miners in Idaho and British Columbia. Sheep grazing was common in the eastern portion of the county. A series of severe winters occurred in the 1860s through the 1890s that devastated livestock, limiting the cattle ranching industry. By 1880, farmers throughout Klickitat County were producing wheat, oats, and barley for export, and by 1900, wheat farming began to eclipse ranching as the county’s dominant industry (Becker 2006). Wheat farming in Klickitat County prior to the twentieth century was horse-dependent and required a significant amount of equipment; remnants of this material culture can still be found across the Project study area (Keith 1976). After World War I, horses were replaced by mechanical tractors that also left their mark on the landscape. A short-lived mining rush in 1895 gave Goldendale its name but had little lasting impact (Attwell 1977; Ballou 1938). A rail line was built in Goldendale in 1903, bringing Klickitat County’s agricultural and lumber products to the rest of the state (McCoy 1987). Transportation improvements continued with the completion of the Spokane, Portland & Seattle Railroad in 1907 (McCoy 1987). Until World War II, Klickitat County’s economy was based on agricultural, livestock, and lumber production; subsequently, these industries went into decline.

The solar facility siting area was extensively patented and homesteaded between 1889 and 1919. While a portion of the land was granted to the Northern Pacific Railroad, individuals patented a considerable amount of land. The earliest plat in the study area was in 1889, 30 years after the county was officially opened for settlement. Only eight additional patents were filed prior to 1900.

3.6.2.4 Local Communities

Bickleton

Bickleton is one of the nearest communities to the study area, located approximately 7 miles northwest (USCB 2018). Bickleton was founded in 1882 by Charles N. Bickle, who also ran the local post office. The young town was mostly destroyed by fire in 1887 but was quickly rebuilt and continued to grow. At its height, Bickleton possessed many local businesses, including a general store, newspaper, bank, drugstore, hotel, livery stables, blacksmith, a lumberyard, and several lumber mills. Three stage lines ran through Bickleton, connecting it to Cleveland and Roosevelt (Alder Creek Pioneer Association 1969).

Roosevelt

The community of Roosevelt is approximately 4 miles south of the Project study area, along the north bank of the Columbia River, a short distance west of the outlet of Wood Gulch (USCB 2018). Roosevelt was founded as a depot serving the route of the Spokane, Portland & Seattle Railway

constructed along the north bank of the Columbia River. T.B. Montgomery laid out the town in 1906, built a hotel, and arranged for a post office, naming it for Theodore Roosevelt (Meany 1923:248). J.A. Foister bought the hotel and opened it. He also built a schoolhouse. A livery business managed the stage line between Roosevelt and Bickleton. In addition, the town had a train station, two general stores, three grain warehouses, a blacksmith shop, a lumber yard, a barber, and the steam ferry connection to Arlington and the Oregon Railroad and Navigation Company Railway on the south bank of the river. The town became the rail and river shipping point for the surrounding area, primarily for wheat, cattle, sheep, and some fruit (Bickleton News 1910).

3.6.2.5 Results of Pedestrian Inventory

As reported in Tennyson et al. (2018), the pedestrian field inventory crew was unable to find two of the previously recorded pre-contact resources and found that another four sites had been disturbed with none of the constituent artifacts present within the Project study area. Two of the historic resources (isolates) were not re-located, and the third was found outside the study area. Several of the historic sites were damaged by fire, mechanical earthmoving activities, and removal of buildings and agricultural machinery. The pedestrian survey also identified 4 previously unrecorded pre-contact resources (2 sites and 2 isolates) and 19 previously unrecorded historic resources (7 sites and 12 isolates) within the study area. These follow the general resource pattern found by previous cultural resource investigations in the region, with the pre-contact resources being lithic concentrations and the historic resources relating to agriculture. In total, Tennyson et al. (2018) documented 27 historic sites, 12 historic isolates, 2 pre-contact sites, and 2 pre-contact isolates within the Project study area.

Three of the isolates and eight of the sites are within the Project area, and another three sites are immediately adjacent to the Project area. One site is crossed by the proposed transmission line corridor. All of the resources within or adjacent to the Project area or transmission line are historic-era. None of the resources within the Project area or transmission line corridor have been recommended as eligible for listing in the NRHP or WHR. One resource adjacent to the Project area is recommended by PaleoWest as not eligible for listing on the NRHP under Criteria A through C, but is unevaluated under Criterion D of the NRHP and considered possibly eligible for listing on the WHR. Resources identified by Tennyson et al. (2018) as within the Project study area are summarized in Table 3.6-3. Information collected during the survey is confidential; the report has been submitted to DAHP via WISAARD as well as to the Confederated Tribes and Bands of the Yakama Nation.

Table 3.6-3. Cultural Resources Identified in the Project Study Area

Trinomial	Period	Site Type	Description	Previously/ Newly Recorded	Register Evaluation (NRHP/WHR)	Location in Relation to Project Area
18-249-SB003	Historic	Cairn/rock feature, debris scatter	Stacked rock jack, with an associated fence line and four cans.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area (adjacent to Project area)
18-249-SB004	Historic	Cairn/rock feature	Two linear rock wall features. Two leaf springs are on the northern rock alignment.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
18-249-SB005	Historic	Debris scatter	Wash tub, oil lantern, metal tubing frame with folding hinges, a paint can, possible wagon frame, and an external friction lid can.	Newly Recorded	Not Eligible/Not Eligible	Project area
18-249-SY001	Historic	Cairn/rock feature	Basalt rock wall alignment with some barbed wire.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
18-249-SY003	Pre-contact	Lithic scatter	Five flakes and one flake tool, chert and petrified wood.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
18-249-SY004	Pre-contact	Lithic scatter	Three flakes and one tool around a natural rock outcrop.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
18-249-SY005	Historic	Debris scatter	Small agricultural debris scatter consisting of three blade fragments from a discer and an oil can.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
18-249-SY006	Historic	Cairn/rock feature, debris scatter	Refuse scatter, a linear rock wall alignment, and a large fencing feature.	Newly Recorded	Not Eligible/Not Eligible	Project area
18-249-SY007	Historic	Debris scatter	Remains of horse-drawn plow and agricultural artifacts.	Newly Recorded	Not Eligible/Not Eligible	Project area
18-249-SY008	Historic	Homestead	11 features, including house, well, collapsed barn and outbuilding, corral, several plows and other agricultural machines, refuse concentration, possible root cellar, and possible privy depression.	Newly Recorded	Unknown (Criterion D)/Possibly Eligible	Solar facility siting area (adjacent to Project area)
18-249-SY009	Historic	Debris scatter	A single hole-in-top can and two crushed lids.	Newly Recorded	Not Evaluated	Solar facility siting area
45-KL-00549	Historic	Cairn/rock feature	Rock alignment; two rock additional features recorded.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area

Trinomial	Period	Site Type	Description	Previously/ Newly Recorded	Register Evaluation (NRHP/WHR)	Location in Relation to Project Area
45-KL-00740	Historic	Homestead	Multiple foundations and building footprints, outbuilding, cistern, cellars, windmill, and farm equipment. PaleoWest recorded an artifact scatter of farm refuse and a large piece of farm equipment.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01312	Historic	Cairn/rock feature	Dugout feature with stacked rock walls on the north, east, and south sides.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01313	Historic	Cairn/rock feature	Dry-stacked basalt rock wall.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01314	Historic	Agricultural	Loading dock, hay rake, and noble plow, appears to have been moved.	Previously Recorded	Not Eligible/Not Eligible	Project area
45-KL-01325	Historic	Cairn/rock feature	Basalt cobble wall alignment.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01327	Historic	Agriculture; debris scatter	Rock-lined well, a concrete trough, and artifact scatter.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01332	Historic	Objects; debris scatter	Two metal car bodies, artifacts, and small depression. Cars appear to have been moved.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01333	Historic	Homestead	Seven features: a house, a pumphouse, a refuse dump, grain bins, a barn, a disc plow, and an outhouse. All have been burned or removed except the pumphouse and grain bins.	Previously Recorded	Not Eligible/Not Eligible	Project area
45-KL-01339	Historic	Debris scatter	Lysol and Alka-Seltzer bottles, ironstone vessel fragments, glass fragments, and approximately 30 cans.	Previously Recorded	Not Eligible/Not Eligible	Project area
45-KL-01351	Historic	Structure unknown, debris scatter	Earthen and basalt rock cellar and artifact scatter. On revisit, the cellar has been filled, and PaleoWest identified a corral, rock cairns, and additional glass and ceramic artifacts.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area

Trinomial	Period	Site Type	Description	Previously/ Newly Recorded	Register Evaluation (NRHP/WHR)	Location in Relation to Project Area
45-KL-01356	Historic	Debris scatter	10 jars, over 200 cans (food tins, tobacco tins, hole-in-top cans), 15 ceramics, miscellaneous farm tools, glass fragments, battery cores.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01357	Pre-contact	Isolate	Basalt chopper.	Previously Recorded. Not Relocated.	N/A - Not Relocated	Solar facility siting area
45-KL-01376	Historic	Debris scatter	Two concentrations of cans and other consumer artifacts. PaleoWest found one concentration to have been destroyed.	Previously Recorded	Not Eligible/Not Eligible	Project area
45-KL-01377	Historic	Debris scatter	Multiple dumping episodes of refuse.	Previously Recorded	Not Eligible/Not Eligible	Project area
45-KL-01484	Historic	Cairn/rock feature	Four-sided basalt slab cairn, with sharp uniform sides.	Previously Recorded. Outside Project Study Area.	Outside Project Study Area. Not evaluated.	Solar facility siting area
45-KL-01892	Historic	Homestead	Barnhouse, a bunkhouse foundation, a root cellar, and various historic residential and agricultural debris.	Previously Recorded	Not Eligible/Not Eligible	Transmission line corridor
45-KL-01893	Historic	Debris scatter, object, cairn/rock feature	Originally an isolate with a pail and a decaying seed drill. PaleoWest changed this to a site and added three stacked rock features, milled wood, several cans and nails, and additional pieces of mechanized farm equipment.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area (adjacent to Project area)
45-KL-01894	Historic	Isolate	Metal pail.	Previously Recorded. Not Relocated.	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01901	Historic	Debris scatter	A pit and artifact scatter with solarized amethyst glass, mason jars and milk glass from lids, and olive glass vessels.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01903	Historic	Isolate	Kerosene can.	Previously Recorded. Not Relocated.	Not Eligible/Not Eligible	Solar facility siting area

Trinomial	Period	Site Type	Description	Previously/ Newly Recorded	Register Evaluation (NRHP/WHR)	Location in Relation to Project Area
45-KL-01904	Pre-contact	Lithic scatter	Four lithic artifacts.	Previously Recorded. Not Relocated.	N/A – Not Relocated	Solar facility siting area
45-KL-01905	Historic	Isolate	Kerosene can.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-01907	Pre-contact	Lithic scatter	24 lithic artifacts, none within survey area. Some modern disturbance.	Previously Recorded. Outside Project Study Area.	Outside Project Study Area. Not evaluated.	Solar facility siting area
45-KL-1485	Historic	Debris scatter, object	Ford car body, mason jars, milk glass from lids, and olive glass vessels.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
45-KL-1891	Historic	Debris scatter	Concentration of approximately 35 metal cans, several glass bottles and jars, and a Ronsonol lighter fluid tin.	Previously Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SB001	Historic	Isolate	“S&W DRIP COFFEE” can with key wind lid.	Newly Recorded	Not Eligible/Not Eligible	Project area
IO-SB002	Historic	Isolate	Oil can.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SB003	Pre-contact	Isolate	Single tertiary yellow CCS flake.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SB004	Historic	Isolate	Rusted 55-gallon metal container embossed with “ATLAS / 18 55 32”.	Newly Recorded	Not Eligible/Not Eligible	Project area
IO-SB005	Historic	Isolate	Single metal can or bucket. Embossed with three asterisks within a circle.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY001	Pre-contact	Isolate	One secondary basalt flake.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY002	Historic	Isolate	Single colorless glass liquor bottle bearing federal reuse warning and “D 90/ (A) /12 58” embossed on the base.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY004	Historic	Isolate	Iron wheel with eight spokes, with some faded yellow paint.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY005	Historic	Isolate	Iron agricultural planter.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area

Trinomial	Period	Site Type	Description	Previously/ Newly Recorded	Register Evaluation (NRHP/WHR)	Location in Relation to Project Area
IO-SY006	Historic	Isolate	Cast iron artifact embossed with “hot air flue” and “part number 8 133, 8 163, and 8 168.”	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY007	Historic	Isolate	Massey-Harris Super 27 combine, dating to 1950.	Newly Recorded	Not Eligible/Not Eligible	Project area
IO-SY008	Historic	Isolate	Crushed white enameled metal pan.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY009	Historic	Isolate	Spouted gas can with soldered seams.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area
IO-SY010	Historic	Isolate	Galvanized steel canteen from early 1900s, with soldered seams and three strap connectors.	Newly Recorded	Not Eligible/Not Eligible	Solar facility siting area

3.6.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed, and there would be no impacts on cultural resources.

3.6.4 Impacts of the Project

Impacts to NRHP- or WHR-eligible or unevaluated cultural resources, including TCPs, would be considered significant impacts. Additionally, pre-contact sites are protected under the provisions of RCW 27.53 and require a DAHP permit if they will be disturbed, regardless of their register eligibility.

3.6.4.1 Construction Impacts

Construction impacts could occur during the initial construction and widening of roads, construction of the solar modules and tracking systems (including associated collector lines), construction of buildings, or activities undertaken within utility corridors (including the transmission line). Although 11 cultural resources have been recorded in the Project area, none have been recommended as NRHP- or WHR-eligible and none are pre-contact sites. As such, impacts on these resources would not be considered significant. If final design requires impacting an NRHP- or WHR-eligible cultural resource, a resource that is unevaluated for register eligibility, or a pre-contact site of any register eligibility status, the Applicant would work with DAHP and, as appropriate, affiliated tribes to mitigate significant impacts.

Tennyson et al. (2018) has included “stop work” recommendations for any inadvertent discoveries of cultural resources during construction. These recommendations provide protocols for protecting, evaluating, and treating discoveries. They are included below as “impact avoidance measures” that will be incorporated into the Project.

3.6.4.2 Operation Impacts

Similar to construction impacts, direct impacts on known cultural resources as a result of activities associated with O&M would not be considered significant because all resources identified in the Project area are historic and have been recommended as not eligible for listing on the NRHP and WHR. As noted above, Tennyson et al. (2018) has included “stop work” recommendations for any inadvertent discoveries of cultural resources, including during O&M.

Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, transportation patterns, or growth rate, as well as related impacts on air, water, and other natural systems, including ecosystems and cultural resources. Solar energy development would not result in appreciable increases of public vehicular traffic to the Project area. Following construction, access roads would have lockable gates to prevent unauthorized personnel from approaching sensitive areas. Indirect effects to cultural resources within the Project area could result from traffic due to increased visits by Project personnel during future maintenance and operation of the facility. Since the gates would be

lockable, the increase in traffic would be minimal, and indirect or secondary impacts to cultural resource sites would be less than significant as a result of Project construction or operation.

3.6.5 Mitigation Measures

The Project has been designed to avoid impacts on identified NRHP- and WHR-eligible cultural resources, as well as pre-contact resources. Prior to construction, Project personnel would be advised about cultural resources and the need to stay away from significant locations. Significant archaeological sites would be identified on construction drawings as generalized “avoidance areas.” Construction managers would be briefed on the locations of site(s) and the need for protection of register-eligible, unevaluated, and pre-contact resources. Although the Project is not anticipated to have significant impacts on cultural resources, the following measures are proposed to avoid inadvertently impacting resources:

- **Avoidance of Site 18-249-SY008:** Archaeological site 18-249-SY008 is adjacent to the Project and possibly eligible for listing on the NRHP and WHR for its potential to yield additional information through buried archaeological deposits. As a measure to avoid inadvertent impact to this site, a 100-foot buffer would be placed on the recorded boundary of this site and marked in the field as a “No Entry” area. Identifying markers would be removed after construction.
- **Potential Impacts Through Redesign:** Pre-contact sites are protected under the provisions of RCW 27.53 and require a DAHP permit if they will be disturbed, regardless of their register eligibility. In the event that final design requires impacts to any of the known pre-contact sites, they must be minimized or mitigated pursuant to the requirements of RCW 27.53. Proposed measures to minimize or mitigate impacts may require obtaining an archaeological permit pursuant to RCW 27.53.060 and WAC 25-48-0604; however, RCW 27.53.060(5) provides for the collection of surface artifacts that are at risk of destruction or alteration without a permit if the collection is conducted by a professional archaeologist in consultation with the DAHP. If impacts to such resources are foreseen, a resource management plan would be prepared and submitted to DAHP detailing how any artifacts will be collected, analyzed, and reported. Any artifact collection will include a plan for the disposition of the collected artifacts. Any plan must pass review from DAHP who will circulate it to agencies, tribes, and landowners for comment before approval.
 - If redesign requires Project-related activities to occur outside of the area surveyed and documented in Tennyson et al. (2018), that area will be surveyed by professional archaeologists for cultural resources, and the results will be documented in an addendum to the survey report.
- **Inadvertent Discoveries:** If previously unidentified cultural resources are unearthed during construction activities, construction work within 100 feet of the find shall be halted and directed away from the discovery until a Secretary of Interior-qualified archaeologist assesses the identity and significance of the resource. At the recommendation of DAHP, an

archaeological permit under WAC 25-48 will be obtained ahead of construction. The archaeologist, in consultation with Klickitat County, DAHP, the Applicant, any interested tribes, and any other responsible public agency, shall make the necessary plans for treatment of the find(s) and for the evaluation and mitigation of impacts if the finds are found to represent pre-contact activities or if it is eligible to the NRHP or WHR.

Previously unidentified human burials, although also unlikely, could be present within the Project. If burials are inadvertently encountered during Project activities, the following Washington State protocol for inadvertent discovery of human remains per RCW 68.50, RCW 27.44, and RCW 68.60 must be immediately initiated:

If ground disturbing activities encounter human skeletal remains during the course of construction, then all activity will cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance. The finding of human skeletal remains will be reported to the county coroner and local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed.

The county coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner/ coroner determines the remains are non-forensic, then they will report that finding to the Department of Archaeology and Historic Preservation (DAHP) who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains (DAHP 2018:32).

Although excavation work in the immediate area of a human remains find will not resume until assessment has been completed, excavation work may continue in other parts of the survey area. Due to the sensitive nature of such a find, human remains should never be left unattended. No work will resume in the area of a human remains discovery until written authorization has been received from DAHP.

3.7 Aesthetics, Light, and Glare

This visual assessment section describes the affected environment and assesses the potential aesthetic, light, and glare impacts that would result from the construction and operation of the Project.

Aesthetic considerations primarily involve visual resources, which are generally defined as the natural and built features of the landscape that can be seen. The combination of landform, water, and vegetation patterns represents the natural landscape features that define an area's visual

character. Built features, such as buildings, roads, and other structures, reflect human or cultural modifications to the landscape. These visual resources contribute to the public's experience and appreciation of the environment.

Aesthetic impacts primarily involve changes to the scenic attributes of the landscape brought about by the introduction of visual contrasts by development actions and the associated changes in the human visual experience of the landscape.

For the purpose of the visual assessment, "Project area" refers to the approximately 1,871 acres within the fenced boundary for the Project components (i.e., solar panels, substation, operations and maintenance building). "Project study area" refers to those landscapes within a 5-mile radius of the solar facility siting area boundary, which represents the area within which the appearance of the Project is most likely to be noticed (see Section 3.7.1.2, Project Study Area).

Avangrid is evaluating a range of solar modules and racking systems as described in Chapter 2. A single-axis tracking module system was used in this assessment because this type of system provides a maximum potential height of the module when fully inverted.

3.7.1 Study Methodology

Klickitat County is required to document compliance with the provisions of the Washington SEPA as part of its review of the EOZ application for the Project. The SEPA rules require consideration of aesthetic, light, and glare impacts associated with a proposed action (WAC 463-60-362 [Built Environment – Land and Shoreline Use]). The methods used to document the existing visual setting of the Project study area and evaluate expected visual changes associated with the Project are discussed below.

The following information sources were key components in developing the description of existing conditions and the analysis of visual impacts that might occur as a result of the Project:

- Local planning documents (Klickitat County zoning, critical areas, recreational, and land use ordinances);
- Project maps, drawings, and technical data;
- Computer-generated map of the areas from which the Project facilities would be potentially visible;
- Aerial and ground-level examination of visual resources within the Project study area and photo documentation of the existing conditions from representative viewpoint locations;
- Photographic simulation from representative viewpoints that depicts the Project components and their potential changes to the existing landscape.

3.7.1.1 Regulatory Setting

Development in the area is guided by Klickitat County land use plans and policies. Comprehensive planning direction for Klickitat County is incorporated into the county's zoning ordinance, which was originally adopted in 1979 and has been amended more than 20 times since. The zoning

ordinance (Klickitat County 2015) establishes a number of zoning districts, based on use classifications, and does not specifically identify scenic resources. One of the zoning districts is the Scenic Design district, for which the stated purpose is to protect vistas, views, and aesthetics of the scenery of the county. Another district is the View Protection district, for which the stated purpose is to protect and preserve the view potential of property owners with exceptionally scenic panoramas. The county zoning map (Klickitat County 2019) does not identify any areas having the Scenic Design district or the View Protection district designation within the Project study area. Based on the specific content of the zoning ordinance and map, no features within the Project study area are identified as important or significant scenic resources. Furthermore, the Project is located within the county's EOZ, for which the purpose, in part, is to allow for the development of energy projects, including solar projects, that can be sensitively sited and mitigated (Chapter 19.39 of the Klickitat County Code). The EOZ was developed, in part, to direct energy development to certain areas within Klickitat County so that impacts would be concentrated and not spread out.

3.7.1.2 Project Study Area

The Project study area is defined as the area within 5 miles of the solar facility siting area boundary. The Project study area was identified based on the potential viewing range within which the Project components (primarily the solar modules) are likely to be noticeable to the casual observer. The "casual observer" is considered an observer who is not actively looking or searching for the Project facilities, but who is engaged in activities at locations with potential views of the Project. If the visual effects of a project are not noticeable to the casual observer, visual impacts can be considered minor to negligible. Viewer distance is a key factor in determining the level of visual effect, with perceived contrast generally diminishing as distance between the viewer and the affected area increases (BLM 1986). The analysis addresses distance zones as they are used in the Bureau of Land Management (BLM) Visual Resource Management (VRM) system. Concepts from the BLM VRM system are widely used for assessment of a variety of projects and, with some modifications, have been applied successfully to projects that do not occur on lands under the jurisdiction of the BLM. The BLM VRM system categorizes views into foreground/middleground, background, and seldom seen distance zones. These distance zones provide a frame of reference for classifying the degree to which details of the viewed Project would affect visual resources. The "foreground/middleground" zone is defined as occurring from zero to 5 miles from the Project. Details of Project elements would be visually clear in the foreground; viewers still have the potential to distinguish individual forms, and texture and color are still identifiable but become muted and less detailed in the middleground. In the "background," defined by BLM as the area 5 miles to 15 miles from the Project, texture has disappeared and color has flattened, making objects appear "washed out." In the relatively flat landscape setting for the Project, although the shape and mass of the solar arrays may be visible at a distance of greater than 5 miles (background distance zone), their visibility would be limited and they would not appear as a prominent feature in the landscape setting, resulting in minimal or negligible visual impacts.

A viewshed analysis was conducted to evaluate the geographic extent of potential visibility of the solar modules. The solar modules were used because they are the largest Project component, and

therefore, the biggest source of contrast introduced into the landscape. This analysis was conducted using ESRI ArcGIS software with the Spatial Analyst extension to process 10-meter digital elevation models of the Project study area terrain. The 16-foot height of the solar module used for the visibility analysis was based on the maximum height of a representative single axis tracking solar module when the module is fully tilted. The viewshed assumed “bare earth” conditions and was developed from the Project area boundary (i.e., the approximately 1,871 acres within the delineated boundary for the Project components) looking out to determine areas with potential visibility based on topography alone. The resulting viewshed map shows areas with potential visibility based on screening by topography only (Figure 3.7-1). It is important to note that potentially “seen” areas identified in the viewshed analysis do not necessarily indicate that the Project would be visible or noticeable to the viewer. “Seen” areas indicate that some portion of the Project is potentially visible from that point because there is a direct, unobstructed line of sight between the point and some location within the Project study area. Other factors such as distance, angle of observation, color, meteorological conditions, and the low profiles of the panels would also affect visibility and noticeability to different viewers. Results of the viewshed analysis are discussed in Section 3.7.4.3.

3.7.1.3 Field Reconnaissance

Tetra Tech staff conducted a field reconnaissance in the Project study area on December 27, 2018, to assess the existing visual character of the landscape. The site visit involved travel on public roads and stops at the pre-determined representative viewpoint locations to record observations and take photographs. Locations where photographs were taken are referred to as “photo points.” The photo points include locations along local roads and public roads near residences that provide views toward the Project area.

An overlapping series of photos was captured at each photo point. Photos from each photo point were subsequently stitched together to create the panoramic images included in Appendix B.

3.7.1.4 Determining Impacts of the Project

Public enjoyment of a scenic resource is subjective and highly dependent on individual viewers’ perceptions of beauty and scenery. Addition of new project facilities into a view may be detrimental to one viewer’s enjoyment of a location but may have a negligible effect for a different viewer. Therefore, a process using the concept of “contrast” based on the BLM VRM system is often used to objectively measure potential changes to landscape features of inventoried resources (BLM 1984, 1986). In the BLM VRM system, potential visual impacts of an action are assessed by considering the level of contrast the action would introduce to the existing landscape. The BLM’s visual contrast rating process (Handbook 8431-1 Visual Resource Contrast Rating) was used as the framework for reviewing potential landscape changes resulting from the Project.

Visual Contrast Rating

The degree of visual contrast is a means to evaluate the level of modification to the existing landscape features. Existing landscape scenery is defined by the visual characteristics (form, line,

color, and texture) associated with the landform (including water), vegetation, and existing facilities within a defined study area. The visual character elements are listed below:

- Form—The shape and mass of landforms or structures
- Line—The edge of shapes or masses, silhouettes, or bands
- Color—The property of reflecting light of a particular intensity of wavelength that the eye can see
- Texture—The nature of the surface of landforms, vegetation, or structures

The level of visual contrast introduced by an action can be measured by changes in form, line, color, and texture that would occur with the action. The greater the difference between these character elements found within the existing landscape and with the proposed action, the more apparent the level of visual contrast becomes.

The degree of contrast introduced to a particular view by an action, in combination with the number and sensitivity of viewers at that viewpoint, would determine the level of visual impacts. The following general criteria are used by the BLM when rating the degree of contrast, and are used in this assessment to characterize the visibility/noticeability of the Project components:

- None—The element contrast is not visible or perceived
- Weak—The element contrast can be seen but does not attract attention
- Moderate—The element contrast begins to attract attention and begins to dominate the characteristic landscape
- Strong—The element contrast demands attention, would not be overlooked, and is dominant in the landscape (BLM 1986).

Contrast ratings for the expected condition with the Project were prepared for each representative viewpoint using a form adapted from BLM's Visual Contrast Rating Worksheet (Form 8400-4); the results are included in Appendix C.

Photographic Simulations

Photographic simulations (simulations) are often used to depict the expected appearance of a proposed action and to provide a basis for assessing the visual effect of the action. Simulations are not a requirement of the EOZ application. Because Lund Hill would be the first solar facility within the Klickitat County EOZ, however, simulations are provided in anticipation that readers would want to see an illustration of how the Project would appear as compared to existing energy facilities in the county. The simulations were created to depict the Project components and their potential changes to the existing landscape. The simulations were used to determine the level of contrast between the existing landscape and the expected landscape if the Project is implemented. Two simulations were created: one from a photo point along Middle Road that represents views experienced by travelers along the roadway and at nearby residences adjacent to the Project area

(Photo Point 1), and one from a photo point along East Road that represents views experience by travelers along the roadway from approximately 0.7 mile east of the Project area (Photo Point 3).

A Nikon D90 digital single lens reflex camera (dSLR) equipped with a 35-millimeter (mm) lens was used to take the photographs. When used with a 1.5x cropped-sensor camera such as the Nikon D90, a 35-mm lens is considered a “52-mm equivalent lens.” A 52-mm equivalent lens is considered a “normal lens” that most closely approximates the field of vision of the human eye. In photographs taken using the combination of the Nikon D90 and a 35-mm lens, the size and scale objects in the background and foreground are depicted realistically and are not distorted. The simulations were created using GIS software, Autodesk 3D Studio Max®, and rendering software.

Photographs of existing conditions and post-construction simulations are provided in Appendix D.

3.7.2 Affected Environment

3.7.2.1 Existing Landscape Character

The existing landscape character provides the context for assessing the effects of changes to the landscape. Landscape character is identified and described by the combination of the scenic attributes that make each landscape identifiable or unique. A region’s landscape character creates a sense of place and describes the visual image of an area. To assess impacts to the landscape’s visual character and quality, it is important to establish the context for the visual environment at both a regional level and at a project-specific level.

Regional Landscape Character

EPA Level III ecoregions of the United States were used to develop a description of the existing landscape character within the Project study area. Ecoregions provide a convenient foundation for describing visual character at the regional level because they are defined based on multiple elements similar to those used in the BLM’s VRM for inventorying and assessing scenic quality (BLM 1986). These factors include physiographic elements of landform, vegetation, water, and cultural modifications, defined as human/man-made modifications to the landscape. The Project study area is located within the Columbia Plateau ecoregion, which is characterized by tablelands of moderate to high relief that take the form of irregular plains with open hills (Wiken et al. 2011). The natural vegetation type consists of arid sagebrush steppe and grasslands. Streams originating within the ecoregion are generally ephemeral, flowing only several days a year or sometimes not at all. Man-made modifications include primarily dryland and irrigated agriculture, and rangeland managed for livestock grazing.

Project Study Area

The Project study area is located in the eastern part of Klickitat County, Washington. It extends to the Columbia River on the south and toward the Simcoe Mountains and Bickleton Ridge to the northwest and north. The Project study area is characterized by flat to moderately rolling terrain cut by moderate to sometimes steep canyons formed by tributaries of the Columbia River. Vegetation consists primarily of sagebrush, bitterbrush, and bunchgrass with riparian vegetation

and conifers along creek beds and canyon bottoms. Land use within the Project study area is comprised of agriculture, rangelands, and commercial wind energy production. Rural residential development is typically associated with agriculture and ranches in the area. Communities nearest to the Project study area include Roosevelt, located approximately 3 miles south of the Project study area, and Bickleton, located approximately 3.3 miles north of the Project study area.

The Project area consists of approximately 1,871 acres of private and state lands located within a 4,513-acre solar facility siting area. The Project area is along the east and west side of Middle Road at the east end of Schrantz Road. The topographic character of the Project area is relatively flat to gently rolling, with elevations ranging from approximately 2,350 feet above mean sea level (amsl) at the northwestern end to approximately 2,000 feet amsl at the southeastern end. Four natural drainageways traverse the Project area on the west side of Middle Road. Vegetation consists primarily of grasses. Three residences located along Middle Road are directly adjacent to the Project area. The next closest residences are approximately 1.2 miles northeast of the Project area. However, it is not anticipated that the residences to the northeast would have views of the Project due to intervening terrain between the residences and the Project area. Several wind farms are located within the Project study area and some are immediately adjacent to the Project area to the north, west, southwest, and northeast. The closest wind turbine is located approximately 450 feet from the Project area's northern boundary. The Roosevelt Landfill is located approximately 3.5 miles southeast of the Project area and 1 mile southeast of the solar facility siting area. The 230-kV Juniper Canyon Wind transmission line crosses through the northern portion of the solar facility siting area.

3.7.2.2 Viewer Types and Characteristics

The term "sensitive viewers" refers to specific user groups associated with various land uses that have a sensitivity to landscape change, and therefore could be adversely affected by the construction and operation of the Project. In this regard, potentially sensitive viewing locations are typically associated with key travel routes, recreation areas, and residential areas. Viewpoints represent critical or typical viewpoints within, or along, an identified viewing location and are used to assess visual impacts of a proposed project. The sensitivity of viewers at each viewpoint is based on the type of use, expected concern for aesthetics, and special status or designation. Identifying groups of individuals that would likely be sensitive to visual changes is an important part of the visual assessment process and helps to define specific locations from which to assess changes to the visual character of the landscape. The inventory of sensitive viewers considered 1) the most critical viewpoints (i.e., views from communities, residential areas, or recreational areas); 2) views from scenic areas specifically identified in local planning documents; and 3) views that represent the general area or landscape setting.

Distinctions among user groups and their expected sensitivity to landscape changes, based on activity types and viewing characteristics, are standard components of a visual assessment. For example, residential viewers are generally expected to have high concern for changes in views from their residences. Motorists' concern generally depends on when and where travel occurs, and the type of travel involved (e.g., commuting vs. recreational travel). However, because their focus is on

driving to their destination and because the time they view the landscape as they drive through is more limited, they may have lower visual sensitivity.

Scenic views designated in land use plans adopted by federal, state, or local government entities typically formalize a recognized visual value of a resource and the public's desire to protect that value (e.g., a designated wilderness or scenic area). Where such officially designated lands exist, the public expectation is that the view at the location of the identified resource would be preserved, and the viewer concern is considered high. Most recreation and tourism-oriented activities in the Project study area occur along the Columbia River corridor, which is located approximately 3 miles south of the solar facility siting area and is widely recognized as a major scenic feature in Klickitat County. State Route (SR) 14, which runs parallel to the north bank of the Columbia River, is identified as the Lewis and Clark Trail Highway and is also designated as a state scenic byway.

In general, the types of viewers present within the Project study area are classified as local residents, motorists, and recreationists associated with the Columbia River. The following discussion summarizes the composition of the groups identified within the Project study area and their characteristics that are relevant to the visual assessment.

Local Residents

The local resident viewer group consists of people who live within the Project study area. Residences within the Project study area include several along Middle Road that are directly adjacent to the Project area and other rural residences located to the west, north, east, and southeast of the site. Among the latter residences, the closest are located approximately 1 mile from the eastern Project area boundary.

Local residents may be more sensitive to changes in their specific views and may have adverse reactions to views of the Project facilities. The existing landscape already includes numerous wind turbines and transmission lines, and as a result, the addition of solar panels to the view would not be as significant a change as it would if the landscape had no development. For example, residents with a view across the open grasslands within the Project study area who have views of multiple wind turbines and distribution and high-voltage transmission lines may be less sensitive to landscape changes than those with just a view of open grasslands.

Travelers

Travelers passing through an area typically view the landscape from motor vehicles on their way to work or other destinations. Travelers include people engaged in various types of business or personal travel. This viewer group is likely to be relatively small because of the small population and limited employment areas within and near the Project study area. Commuters do not tend to stop along their travel routes, have a relatively narrow field of view because they are focused on road and traffic conditions, and are destination-oriented. Passengers in commuter vehicles would have greater opportunities for prolonged off-road views toward landscape features and, accordingly, may have greater perception of changes in the visual environment. Through travelers are typically moving, have a relatively narrow field of view and are destination-oriented. Generally,

drivers in this group are focused on driving and on the road and traffic conditions but do have the opportunity to observe roadside scenery.

Most travel routes within the Project study area consist of secondary roads maintained by Klickitat County, farm roads, and access roads serving the existing wind farms. SR 14 and Interstate 84 (across the Columbia River in Oregon) traverse the southern portion of the Project study area. It is anticipated that local roads in the Project study area are used primarily by people traveling to and from residences and work locations, such as workers associated with the operation of the wind farms. This viewer group is likely to produce relatively small traffic volumes because of the small resident population and limited employment within the Project study area.

Tourists and Recreational Users

This viewer group includes local residents engaged in recreational activities and tourists and recreational users visiting from out of the local area. These users can be involved in outdoor recreational activities at parks and other developed recreational facilities or in undeveloped natural settings such as forests, fields, and water bodies. Tourists and recreational users come to or travel through the area to experience cultural, scenic, and/or recreational resources.

The recreational user group includes those involved in active recreation (e.g., hunters and bicyclists) and those involved in more passive recreational activities (e.g., picnicking, sightseeing, wildlife observation, or walking). For some of these viewers, scenery is a very important part of their recreational experience, and recreational users often have continuous views of landscape features over relatively long periods of time. However, most recreational viewers would only view the surrounding landscape from ground-level vantage points. Recreational users' sensitivity to visual quality and landscape character would be variable, depending on their reason for visiting the area. For example, an off-highway vehicle recreation user is considered less sensitive to visual change than a wildlife viewer or a recreator looking for a cultural experience. However, recreators are generally considered to have relatively high sensitivity to scenic quality and landscape character.

Recreation within the Project study area primarily involves activities associated with the Columbia River, such as fishing and boating, and tourists driving on SR 14 (Lewis and Clark Trail Highway).

3.7.2.3 Representative Viewpoints

Scenery is the aggregate of features that give character to the landscape (BLM 1984). Typically, every landscape comprises varying levels of landform, vegetation, existence of water, color, scarcity, adjacent scenery, and cultural modifications, all of which combine to exhibit landscape character (BLM 1986). Existing landscape conditions in the Project study area were characterized through review of applicable existing documentation and aerial photography and information obtained in a field reconnaissance. Six representative viewpoint locations within the Project study area were identified based on review of the viewshed results and consideration of types of likely viewing locations. Table 3.7-1 provides descriptions of representative viewpoint locations within the Project study area and their associated existing viewing conditions. The locations of each of

these representative viewpoints are shown on Figure 3.7-1 and photographs from each of the viewpoints are provided in Appendix B.

Table 3.7-1. Representative Viewpoints

Photo Point	Location	Resource Type	Existing Landscape Characteristics
1	Middle Road, approximately 0.5 mile south of Schrantz Road and approximately 400 feet to the Project area at the closest point.	Residential	The landscape is characterized by relatively flat to gently rolling grasslands. Man-made features include a gravel road, residential structure, silos, fences, telephone line, high-voltage transmission line, and multiple turbines, with the closest turbine located approximately 1 mile north of the photo point.
2	Middle Road, approximately 0.5 mile north of Schrantz Road and approximately 0.2 mile north of the Project area at the closest point.	Travel way	The landscape is characterized by relatively flat to gently rolling grasslands. Evergreen and deciduous trees associated with rural residences are visible in the background along with residential structures. Other man-made features include a gravel road, fences, high-voltage transmission line, and several wind turbines, with the closest turbine located approximately 2 miles to the east of the photo point.
3	East Road, approximately 1 mile south of Whitmore Road and approximately 0.7 mile east of the Project area at the closest point.	Travel way	The landscape setting is characterized by flat grasslands and a moderately steep canyon. Vegetation consists primarily of grasses with shrubs and evergreen trees scattered along the slopes of the canyon. Man-made features include a paved road, short metal post fence, telephone line, and multiple turbines, with the closest turbine located approximately 1.5 miles northwest of the photo point.
4	Schrantz Road, approximately 1 mile west of Middle Road and approximately 0.6 mile west of the Project area at the closest point.	Travel way	The landscape setting is characterized by flat to gently rolling grasslands with trees associated with residential development visible in the distance. Man-made features include a gravel road, high voltage transmission line, telephone poles, low metal post fence, and several turbines, with the closest turbine located approximately 0.2 mile east of the photo point.
5	East Road, approximately 0.5 mile east of Middle Road and approximately 3 miles south of the Project area at the closest point.	Travel way	The landscape setting is characterized by flat to moderately rolling terrain covered primarily by grass with trees and shrubs clustered around rural residential development or scattered throughout the landscape. Man-made features include gravel and paved roads, telephone lines, and several turbines, with the closest turbine located approximately 3.5 miles northwest of the photo point.
6	Middle Road, approximately 0.9 mile south of East Road and approximately 4 miles south of the Project area at the closest point.	Travel way	The landscape setting is characterized by flat to moderately rolling terrain covered primarily by grass with trees and shrubs clustered around rural residences or scattered throughout the landscape. Low hills are visible in the background. Man-made features include a paved road, low metal post fence, telephone lines, and several turbines, with the closest turbine located approximately 5 miles west of the photo point.

3.7.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed or operated as proposed. Future land uses within the Project study area would likely be similar to current uses for the foreseeable future.

3.7.4 Impacts of the Project

Where visible and noticeable, the Project facilities would introduce visual contrast and have the potential to create visual effects. The sections below describe potential visual effects anticipated from the construction and operation of the Project. At the end of the Project's operational life, it would be decommissioned in accordance with a detailed Project decommissioning plan that would be developed in compliance with applicable laws, regulations, and BMPs at that time.

Decommissioning activities would be similar to construction activities but would occur over a shorter period of time than initial construction. Once Project components are removed, the Project area would generally return to pre-existing conditions.

3.7.4.1 Construction Impacts

Short-term visual effects would occur during construction of the Project and would result from construction activities and the presence of construction equipment and work crews. Construction activities associated with the solar facility would include surveying, clearing portions of the construction site, stockpiling top soil, grading, trenching for installation of electrical collector lines, installation of support pilings, delivery of the solar panel and substation components, solar panel installation, installation of substation foundations, placement and erection of substation equipment, placement of perimeter fencing, and revegetation with low-growing grasses.

Visual contrast introduced during Project construction would be evident primarily for local residents and travelers along Middle Road, East Road, and Schrantz Road, adjacent to the Project area, where the presence of construction equipment, materials, and crews would be prominent in the foreground. Views of Project construction from areas not immediately adjacent to the Project area would be limited primarily to travelers along local roads. Views of Project construction from areas not immediately adjacent to the Project area would be mostly screened by topography. Visual effects that occur as a result of construction activities would be short-term because construction equipment and crews would be removed once construction is complete.

3.7.4.2 Operation and Maintenance Impacts

Project Facility Characteristics

Long-term visual effects during operation of the Project would result from the visibility of the above-ground components associated with the Project, including the solar array, overhead 34.5-kV collector lines, collector substation, O&M building, perimeter fence, and an overhead 230-kV transmission line (if required).

Solar Modules

The Project area and the surrounding area consists of relatively flat to gently rolling grasslands with deciduous and evergreen trees clustered around farm and rural residences or sparsely scattered across the landscape. The regular geometric forms and strong horizontal and vertical lines associated with the solar arrays and associated infrastructure would contrast with the organic forms and colors of the existing landform and vegetation. In addition, color contrast associated with

the solar panels would vary throughout the day as the panels rotate to track the sun from east to west. The dark, dull color of the panels would be in contrast with the dull hues of the surrounding green/tan grasslands and dark and grey-green vegetation. Although the solar modules would contrast with the elements of the natural landscape, their overall visual effect would be reduced because of existing noticeable modifications to the local natural landscape. The Project area is surrounded by existing wind energy facilities, including several turbines located within 0.5 mile of the Project area. In addition, small-scale utility lines and high-voltage electric transmission lines are located along local roads within, adjacent to, and near the solar facility siting area. Most views of the solar modules would be seen in the context of these existing features, specifically the wind turbines, which currently dominate the landscape. Furthermore, from locations 1 mile or more from the Project area, those portions of the solar arrays that are visible would generally appear as a thin dark line on the horizon and would be seen as a subordinate feature in the context of the existing wind turbines. In these locations, the solar modules may not attract the viewers' attention.

Power Collection System

The Project's power collection system includes 34.5-kV power collector lines and a collector substation. Some sections of the collector lines would be installed above-ground on wooden pole structures and would be visible to varying degrees, depending on the proximity of the viewer. The overhead collector lines would be similar in form, size and color to the local utility lines that are present along roads within the Project study area and would be seen in the context of other existing vertical elements, including wind turbines and high-voltage transmission lines. Therefore, the overhead collector lines would likely create weak contrast where they are visible.

Under the facility layout described in Chapter 2, a collector substation would be constructed on a 5-acre site enclosed by chain-link fencing. The substation would introduce vertical and geometric metal structures into a relatively flat landscape. The substation equipment would be seen in the context of other tall, vertical elements in the existing landscape, including existing wind turbines, high voltage transmission lines and utility lines. Therefore, the substation would introduce limited additional visual contrast.

Overhead 230-kV Interconnection

Under the facility layout described in Chapter 2, an overhead 230-kV transmission line would be constructed from the collector substation to the existing Juniper Canyon 230-kV transmission line. The 230-kV interconnection would require up to two steel monopole structures measuring up to 100 feet in height inside or immediately outside the collector substation, thereby introducing two new vertical metal structures into the existing landscape setting. These structures would be seen in the context of other existing vertical elements, including existing wind turbines and high-voltage transmission lines, and in the context of electrical equipment associated with the collector substation. Therefore, where visible, the 230-kV interconnection would create weak contrast.

If the solar array and substation are shifted south during final design³, the 230-kV transmission line could be up to 6 miles in length in order to reach the existing Juniper Canyon transmission line. Under this scenario, the 230-kV line would generally run parallel to Middle Road and be supported on wooden, H-frame structures similar to those of the existing Juniper Canyon 230-kV transmission line. If the longer 230-kV line is built, it would not be out of character with the existing landscape setting.

Operations and Maintenance Facility

If the Big Horn O&M facility cannot be used, a new O&M facility would be located adjacent to the solar array. The new O&M facility would include an approximately 5,000-square-foot, pre-fabricated steel building with a workshop/garage and office space. The building would be 16 feet tall at the roof peak and would have siding that would be painted with low-reflectivity paints in earth-tone colors that blend with the surrounding landscape. The O&M facility would be seen to varying degrees from roads that pass through or near the Project area and from nearby residences. Views toward the O&M facility from most perspectives would also include views of other Project components, including the solar arrays and collector substation, as well as existing wind turbines, high-voltage transmission lines, and utility lines. Given the scale of the O&M facility in relation to other Project components and existing features in the landscape, it is anticipated that, where visible, the O&M facility would create weak contrast. Furthermore, the O&M building would be similar in form and scale to other energy facility O&M facilities, agricultural buildings, and storage areas that are common in the area. Therefore, the O&M facility would not appear out of character with the existing landscape setting.

3.7.4.3 Extent of Potential Visibility of the Solar Array

The geographic extent of potential visibility of the solar modules within the Project study area was determined through the viewshed analysis as discussed in Section 3.7.1.2. Based on the viewshed analysis, it is anticipated that views would be limited primarily to the area within approximately 1 to 2 miles surrounding the solar modules, with additional areas of potential visibility in relatively higher-elevation areas to the southeast, south, and southwest (see Figure 3.7-1). Potential areas from which the facility may be visible include residences adjacent to the Project area, and portions of local roads including Middle Road, East Road, Schrantz Road, and Dot Road. The degree of visibility for residents and viewers along local roads within these areas is discussed below in Section 3.7.4.4. According to the viewshed analysis, views of the solar modules from residences not directly adjacent to the Project area would be screened by intervening terrain. Views of the solar modules from local roads are limited primarily to Middle Road, which passes through the Project area; Schrantz Road, located west along the edge of the Project area; East Road, located

³ The 1,871-acre Project area is a subset of the approximately 4,513-acre "solar facility siting area," within which the Applicant has proposed a general layout for the purpose of analyzing potential resource impacts. The assumptions included in this general layout are intended to provide a potential worst-case scenario to assess potential Project environmental impacts under SEPA. The layout presented in the EIS was selected for analysis because it is a likely location within the solar facility siting area and because it depicts the greatest potential impacts to most resources.

approximately 0.7 mile east of the Project area; and access roads to the north and southwest of the site that serve the existing wind farms. Based on the viewshed analysis, it is anticipated that views from other local roads located 1 mile or more from the Project area would be screened by topography.

The viewshed analysis results presented in Figure 3.7-1 reflect potential visibility of the Project based on location of the solar modules as indicated in the northern portion of the solar facility siting area. If the solar modules were to be relocated farther south within the solar facility siting area, the configuration of the solar array would be different and would cause corresponding changes in the areas of potential visibility within the Project study area.

3.7.4.4 Visual Effects at Representative Viewpoints

Contrast ratings were prepared for each representative viewpoint using a form adapted from BLM's Visual Contrast Rating Worksheet (Form 8400-4). Results for the representative viewpoints are discussed below and the contrast rating worksheets are included in Appendix C.

Representative Viewpoint 1 – (Residential)

The nearest portion of the solar array would be located approximately 200 feet from this viewpoint location. In addition, the O&M facility and collector substation would be located approximately 0.3 and 0.5 mile from this viewpoint, respectively. Views toward the Project would be unobstructed. The Project facilities would be seen in the context of the existing visual setting, in which wind turbines are the dominant features in the landscape. Because of the proximity of the Project to the viewpoint (within 0.5 mile), it is anticipated that the Project would be noticeable but subordinate features to the wind turbines (see Visual Simulation for Middle Road in Appendix D). As such, the Project would create moderate visual contrast.

Representative Viewpoint 2 – (Travel Way – Middle Road)

The nearest portion of the solar array would be located approximately 0.2 mile from this viewpoint location. In addition, the collector substation and O&M facility would be located approximately 0.2 and 0.4 mile from this viewpoint, respectively. Views toward the Project would be unobstructed. Although the Project is located within the immediate foreground of the viewpoint, the Project would be seen in the context of the existing wind turbines which are currently the dominant feature in the landscape. The Project would be noticeable; however, Project components would be subordinate features compared to the existing wind turbines. As such, the Project would create moderate visual contrast. Because travelers would be approaching or parallel to the Project area only for a limited time and their focus would be on the road ahead, the degree of contrast would be reduced by the short view duration.

Representative Viewpoint 3 – (Travel Way – East Road)

The nearest portion of the solar array would be located approximately 0.8 mile from this viewpoint location. The collector substation and O&M facility would be located approximately 3 miles from this viewpoint. Views toward the solar modules would be unobstructed, although the collector

substation and O&M facility would be mostly screened by topography and the solar array. The dark solar modules would appear as a thin, dark line on or near the horizon in this view and would attract little attention in the context of the existing wind turbines (see Visual Simulation for East Road in Appendix D). As such, the Project would introduce weak additional visual contrast to the existing setting. Because travelers would be approaching or parallel to the Project area only for a limited time and their focus would be on the road ahead, the degree of contrast would be reduced by the short view duration.

Representative Viewpoint 4 – (Travel Way – Schrantz Road)

The nearest portion of the solar array would be located approximately 0.6 mile from this viewpoint location. The collector substation and O&M facility would be located approximately 1 mile from this viewpoint. Views toward the solar modules would be unobstructed, although the collector substation and O&M facility would be partially screened by the solar array. The solar array would appear as a dark geometric feature along the horizon and would most likely screen the lower portions of the O&M building and substation equipment. The portions of these features that are visible would be seen in the context of several vertical features in the landscape. Because of the proximity and number of turbines and utility lines to the viewer, it is anticipated that Project would appear as a subordinate feature. As such, the Project would create weak visual contrast.

Representative Viewpoint 5 – (Travel Way – East Road west of Middle Road)

The nearest portion of the solar array would be located approximately 3 miles from this viewpoint location. The collector substation and O&M facility would be located approximately 5 miles from this viewpoint. Views toward the Project would be unobstructed. The solar array would appear as a dark geometric feature along the horizon and would most likely screen the lower portions of the O&M building and substation equipment. At a distance of 5 miles (background distance zone), it is not anticipated that the O&M building and collector substation would be discernible or noticeable. Because of the distance of the Project to the viewpoint and the existing contrast created by the presence of the turbines, it is anticipated that Project would appear as a subordinate feature. As such, the Project would create weak visual contrast.

Representative Viewpoint 6 – (Travel Way – Middle Road south of East Road)

The nearest portion of the solar array would be located approximately 4 miles from this viewpoint location. The collector substation and O&M facility would be located approximately 6 miles from this viewpoint. Views toward the Project would be unobstructed. The solar array would appear as a dark geometric feature along the horizon and would most likely screen the lower portions of the O&M building and substation equipment. At a distance of 6 miles (background distance zone), it is not anticipated that the O&M building and collector substation would be discernible or noticeable. Because of the distance of the Project to the viewpoint location and the existing contrast created by the presence of the turbines, it is anticipated that Project would appear as a subordinate feature. As such, the Project would create weak visual contrast.

3.7.4.5 Light and Glare Impacts

Light

The Project construction schedule may include some activity at night. If so, temporary lighting would need to be used at specific construction sites and would result in short-term visual effects from the presence of additional nighttime lighting within the Project study area. Construction lighting would be evident primarily within the local area adjacent to the solar facility and may be seen by residents and travelers along Middle Road, East Road, and Schrantz Road. Because these effects would be localized and temporary, lighting impacts associated with any night construction activity would be insignificant.

Proposed lighting associated with operation of the Project includes security lighting installed at entry gates and along the collector substation and O&M facility's perimeter fence. Security lighting would be directed downward and shielded to avoid light trespass and nighttime light pollution impacts. The amount and character of light generated by the Project security lights would be consistent with existing sources within the Project study area. The existing light sources include outdoor lighting at residences and other domestic structures near the Project area, security lights associated with existing O&M facilities and substations located within the Project study area, and Federal Aviation Administration-required lights on the existing wind turbines.

Glare

The Project is not anticipated to introduce a significant source of glare into the existing environment. The solar panels are designed to absorb sunlight rather than reflect it, and the glass panels that protect the panel surface are typically formulated with glass designed to allow sunlight to pass with minimal reflection. Panels would have anti-reflective coatings that would further reduce reflectivity from solar modules.

The single-axis tracker system would rotate the panels so they are aimed at the sun throughout most of the day, and any reflected sunlight would be aimed directly back at the sun. During morning and evening hours when the trackers cannot directly match the angle of the sun, the tilt would not be low enough to produce lower angles of reflection.

Based on solar module design and construction as well as operation of the tracker system, glare resulting from the reflection of sun off solar panels would occur to a limited extent within the Project study area. Although the Project would represent an additional source of glare in the Project study area, introduced glare would not be sufficient to adversely affect views in the area or create an annoyance for viewers. Therefore, glare impacts from the Project would be negligible.

3.7.4.6 Indirect or Secondary Impacts

The aesthetic, light, and glare impacts discussed above would occur at locations within the Project study area that would have visibility of the Project facilities. Some effects would be limited to the construction period, while others would occur throughout the operational life of the Project. The visual effects of the Project are not expected to influence development activity or land use patterns

within the Project study area or result in related changes to natural systems. Therefore, no indirect or secondary impacts associated with the visual effects have been identified.

3.7.4.7 Decommissioning

At the end of the Project's operational life, it would be decommissioned in accordance with a detailed Project decommissioning plan. A security would be coupled with the decommissioning plan and would be a bond, letter, or other security acceptable to Klickitat County. A security is required per Klickitat County Zoning Ordinance (Section 2.30: 10.2[I][iv]) to ensure proper decommissioning of the Project. The amount of the security would be determined based on the site-specific conditions affecting the costs of decommissioning, such as site accessibility, depth of foundations, and terrain characteristics. Appendix E provides assumptions used to develop the estimated cost of decommissioning the facility. These assumptions constitute the high-level decommissioning plan for the facility. This decommissioning plan, along with the security, requires approval by the Klickitat County Planning Department.

Decommissioning activities would be similar in nature to construction activities. Once Project components are removed, the Project area would return to pre-construction conditions.

3.7.5 Mitigation Measures

The following mitigation measures would be an integral part of the Project's design:

- Good housekeeping would be implemented to maintain the Project area free of debris, trash, and waste during construction.
- When construction is complete, areas disturbed during the construction process would be reseeded.
- Panels would have anti-reflective coatings that would reduce the level of reflectivity.
- The electrical collection system would be located underground, to the extent practicable. Structures would be constructed overhead for portions where necessary based on engineering constraints.
- The O&M building would have a low-reflectivity, earth-tone finish to maximize its visual integration into the surrounding landscape.
- The parking areas at the O&M facility would be covered with gravel, rather than asphalt, to minimize contrast with the site's soil colors.
- Outdoor night lighting at the O&M facility and substation would be kept to the minimum required for safety and security, sensors and switches would be used to keep lighting turned off when not required, and all lights would be hooded and directed to minimize backscatter and off-site light trespass.
- Use of the existing Juniper Canyon transmission line constitutes consolidation of transmission infrastructure as required by Klickitat County code and will reduce the need to construct a new transmission line.
- The chain-link fence surrounding the Project area would have a dulled finish or coating to reduce its contrast with the surroundings.

3.8 Public Safety and Environmental Health

3.8.1 Study Methodology

Several low-probability potential public health and safety hazards have been identified for solar farms. These potential hazards could include fire or explosion; glare; inadvertent release of hazardous materials; terrorism, sabotage, or vandalism; and electric and magnetic fields. Potential effects to public health and safety from the identified hazards were identified by reviewing the proposed placement of the Project facilities and through a review of available data for similar projects.

3.8.2 Affected Environment

There are three residences within the lease boundary that are excluded from the solar facility siting area, and one residence within a mile of the lease boundary (located in a small internal triangle cut out from the lease boundary). No residences are within a mile of the outer lease boundary line. Three of the four residences (including the non-participating resident) are located, starting from the north, 570 feet, 594 feet, and 547 feet from the proposed solar array, with the fourth resident located nearly 2 miles away.

Two existing county roads would be used to access the Project area: Middle Road and Roosevelt Grade Road. Two existing unpaved roads in the Project area would also be used for access.

3.8.2.1 Public Health and Safety Hazards

A limited number of public health and safety hazards currently exist within the Project area. Wildfires are the primary hazard because much of the area is arid. The summer season, when the area is hot and dry, poses the greatest risk for fire. Fires could be started by lightning strikes or by human activities such as cigarette disposal, campfires, or arson; however, lightning strikes are rare and human activities are limited in this area. A Draft Community Wildfire Protection Plan, developed in 2017-2018 by the Klickitat County Community Wildfire Protection Plan committee, WDNR, and Klickitat County Department of Emergency Management (Klickitat County 2018a), identifies strategies and priorities for protecting life, property, and infrastructure (including the Project area). The Community Wildfire Protection Plan identifies the nearby Dot Road and East Road as ingress-egress routes serving eastern and south-central Klickitat County, connecting the Project with the Bickleton Highway and State Highway 14 along the Columbia River. These roads offer fire-escape options, which will require through-access to be maintained and Project employees to familiarize themselves with the road layout. Refer to the Public Services and Utilities section in this EIS for information on fire response within the Project area.

3.8.2.2 Regulatory Framework

A number of state and federal regulations apply to public health and safety. Applicable regulations are administered through the Occupational Safety and Health Administration (29 CFR 1910), the Federal Aviation Administration, and the Washington Industrial Safety and Health Act (49.17 RCW). In addition, a number of health and safety standards have been developed for solar arrays. These

include standards of the American Society of Mechanical Engineers, the American National Standards Institute, the American Society of Testing and Materials, the National Fire Protection Association, Underwriters Laboratories, and the Institute of Electrical and Electronics Engineers.

3.8.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. There would be no change from current conditions and, therefore, there would be no Project-related effects to public health and safety.

3.8.4 Impacts of the Project

3.8.4.1 Construction Impacts

During construction, there could be potential Project-related fire hazards, as well as the potential for hazardous material spills.

Human activities during construction activities (such as welding) would likely result in the greatest potential for fires. However, the Project would be required to implement all applicable state and local health and safety regulations, which would minimize the potential for fire hazards. Because combustible materials (such as gasoline, diesel fuel, and oil) would be used in construction equipment, there would be an increased risk of fire hazards, but this risk would be mitigated by all construction vehicles being equipped with fire extinguishers. The Applicant would notify the local fire district of construction plans and phasing, identify the location of and access to Project structures, and provide mutual assistance in the case of fire in or around the Project area during construction. In addition, a Fire Protection and Prevention Plan would be developed and implemented for construction and operation of the Project. Appendix F provides an Emergency Management Plan developed for another Avangrid solar facility that provides an example of the types of measures that may be adopted for the Project. Included in the Fire Protection and Prevention Plan would be information related to the following:

- Major workplace fire hazards and proper materials handling and storage procedures
- Potential ignition sources for fires and their control procedures
- The type of fire protection equipment or systems that can control a fire, and how to maintain and use them.

Refer to the Public Services and Utilities section in this EIS for information on fire emergency response capabilities in the Project area.

Spills of fuels, lubricating oils, and mineral oil could occur as a result of vehicle accidents, equipment malfunction, human error, or vandalism. The Applicant has committed to preparing a SPCC plan that addresses potential spills, prevention measures, and response procedures in the event of a spill. It is expected that spills, should they occur, would be confined to the Project area.

3.8.4.2 Direct Impacts

Construction and operation of the Project could have public health and safety effects on the general public, temporary construction workers, and energy facility employees. During construction, public health and safety effects could result from fire, or hazardous materials spills. Risks during operation include glare; terrorism, sabotage, or vandalism; and modified electric and magnetic fields. These potential effects are discussed in this section.

Fire Hazards

During Project construction, operations, and maintenance, human activities and lightning strikes could cause fire. Lightning protection measures would be implemented to protect generators and other associated ground equipment, and prevent or reduce the potential for fires or other damage to the equipment. The site would be equipped with fire protection equipment in accordance with the Washington fire code, and the Applicant would provide mutual assistance to local fire departments in the case of fire in or around the Project area during construction. Temperature sensors would detect internal fires and send an alarm signal to the central supervisory control and data acquisition system at the O&M facility, which would notify Project operators of the situation. See the Public Services and Utilities section in this EIS for additional information on fire emergency response in the Project area.

Hazardous Materials

Potentially hazardous materials that would be used for construction include paint and unused solvents; spent vehicle and equipment fluids and components (e.g., used oil, used hydraulic fluids, oily rags, and spent lead-acid or nickel-cadmium batteries). All of the fluids would be monitored periodically and stored within the O&M building in compliance with the SPCC⁴ plan. Any oily waste, rags, or dirty or hazardous solid waste would be collected in sealable drums and removed for recycling or disposal by a licensed contractor.

Leaks of hazardous materials or fluids could result from equipment failure, lightning strikes, or vandalism; however, measures would be implemented to minimize the risk of these spills occurring or causing adverse effects. The power transformers would be equipped with an oil-level monitoring system. A loss of oil level would be sensed, and an alarm message would be sent to the central supervisory control and data acquisition system. The power transformers would be surrounded by a containment berm or trough to retain any leaked oil. In the unlikely event of an accidental hazardous materials release, any spill or release would be cleaned up and the contaminated soil or other materials disposed of and treated according to applicable regulations. Spill kits containing items such as absorbent pads would be located within construction vehicles and at designated areas in on-site temporary storage facilities. Employees handling hazardous materials would be instructed in the proper handling and storage of these materials as well as the location of spill kits. Waste fluids would be transported from the site to an appropriate disposal

⁴ The SPCC plan outlines the procedures, methods, and equipment used at the facility to comply with the Environmental Protection Agency's standards.

facility by a licensed contractor. The Project would comply with SPCC plan requirements, as regulated under the Oil Pollution Act, as well as other applicable permits that regulate water quality. Furthermore, because public access to the site would be restricted, the public is not expected to be directly exposed to risks resulting from the potential release of hazardous materials.

Glare

The proposed solar array is designed to generate power through the absorption of sunlight. This process could result in glare that may be visible to motorists and aircraft pilots. A full discussion of potential glare is provided in Section 3.7, Aesthetics, Light, and Glare. Glare is not expected to be a hazard to public safety.

The surfaces of other Project infrastructure, such as the O&M building and inverter boxes, would be treated to reduce potential visibility and reflectivity through use of dulled color finishes selected to blend into the landscape.

Terrorism/Sabotage/Vandalism

The Project facilities would be located near county-maintained roads that would allow the general public to approach the facility. However, chain-link perimeter fencing would be used to enclose the Project area, including the substation, with up to eight locked gates installed along existing roadways. Doors to other outdoor facilities would be locked. In addition, staff would be encouraged to query strangers about the nature of their business, and all staff would be trained in security procedures upon being hired and annually thereafter. Because access to the entire facility would be restricted, and because a site security plan would be implemented, the risk of terrorism, sabotage, or vandalism is considered to be low.

Electric and Magnetic Fields

All electric utility wires and devices generate alternating electric and magnetic fields (EMFs). The earth itself generates steady-state magnetic and electric fields. The EMF produced by the alternating current (AC) electrical power system in the United States has a frequency of 60 Hertz (Hz), meaning that the fields change from positive to negative and back to positive 60 times per second. The current follows the voltage, flowing forward, reversing direction, and returning to the forward direction (again, a 360-degree cycle) 60 times every second. Each AC three-phase circuit carries power over three conductors. One phase of the circuit is carried by each of the three conductors. The AC voltage and current in each phase conductor are out of sync with the other two phases by 120 degrees, or one-third of the 360-degree cycle. The fields from these conductors are also out of phase with each other and would tend to cancel out because of the phase difference. Directly underneath an overhead transmission line, the conductors are far enough apart that the phase cancellation is not perfect, and a resulting net magnetic field is produced. However, in the area directly over an underground line, the conductors are placed much closer together and the cancellation of the magnetic fields between the phases is much more effective. This better phase cancellation results in very low magnetic fields at the surface.

Electric Fields

Electric fields around transmission lines are produced by electrical charges, measured as voltage, on the energized conductor. Electric field strength is directly proportional to the line's voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance from the conductors, so that the electric field strength declines as the distance from the conductor increases. For the transmission line proposed for this Project, the voltage and electric field would alternate at a frequency of 60 Hz. The strength of the electric field is measured in units of kilovolts per meter. The voltage, and therefore the electric field, around a transmission line remains practically steady and is not affected by the common daily and seasonal fluctuations in electricity use.

Magnetic Fields

Magnetic fields around transmission lines are produced by the electrical load or the amount of current flow, measured in terms of amperage, through the conductors. Like the electric field, the magnetic field alternates at a frequency of 60 Hz. The magnetic field strength is directly proportional to the amperage; that is, increased amperage produces a stronger magnetic field. The magnetic field is inversely proportional to the distance from the conductors. Also, like the electric field, the magnetic field strength declines as the distance from the conductor increases. Magnetic fields are expressed in units of milligauss. However, unlike voltage, the amperage (and, therefore, the magnetic field around a transmission line) fluctuates hourly and daily as the amount of current flow varies. The strength of the magnetic field depends on the current in the conductor, the geometry of the construction, the degree of cancellation from other conductors, and the distance from the conductors or cables.

When electric cabling between the solar modules and strings is buried in the ground, EMF exposure is effectively eliminated. Electric and magnetic fields are considered a potential issue only when high-voltage (115 kV and greater) lines are in close proximity to residences, typically modeled to be less than 300 feet. The strength of the EMF dissipates quickly as the distance from the source increases. For the Project, the closest residence would be more than 1,600 feet from a high-voltage (i.e., 230-kV) overhead transmission line which connects to the existing Juniper Canyon Wind Farm 230-kV transmission line. All residences would be more than a mile away from the collector substation. The Project would comply with the minimum county-required setback for solar facilities of 500 feet from both participating and non-participating residences. At this distance, EMF generated by the Project would be comparable to background levels already existing in the environment. Potential risks to employees would be managed through implementation of standard health and safety procedures in design, construction, and operation of the facility.

3.8.4.3 Indirect or Secondary Impacts

Because most of the electricity generated by the Project would be transmitted to areas outside Klickitat County, indirect effects related to new population growth are not anticipated in Klickitat County. In addition, the Project would not require any rerouting of existing roadways, including those designated as fire escape routes. Solar strings would be set back from residences and

roadways to limit potential effects, including safety and health effects, on residents and transportation systems.

3.8.5 Mitigation Measures

The Project would comply with all applicable local, state, and federal safety, health, and environmental laws, ordinances, regulations, and standards, as well as any required plans and BMPs. During construction and operation, the following mitigation measures would be implemented to avoid or minimize the potential effects associated with public health and safety:

- An on-site health and safety plan would be developed and implemented to inform employees and others on site what to do in case of emergencies, including the locations of fire extinguishers and nearby hospitals, telephone numbers for emergency responders, and first aid techniques (Klickitat County Code Section 19.39:8, B.9(a) through (f)). Employees shall be trained to address healthy and safety emergencies, and to safely operate and maintain the solar facility and other mechanical equipment.
- On-site vehicles would be monitored for petroleum leaks. Spills would be cleaned up immediately upon discovery and reported to the appropriate agency.
- Vehicle servicing and refueling would occur off site in a temporary staging area equipped for fuel or oil spills.
- Any hazardous waste material generated by Project construction and operation would be disposed of in a manner specified by local and state regulations or by the manufacturer.
- Clean-up materials would be kept readily available on site, either at the equipment storage area or on the contractors' trucks.
- An SPCC plan would be developed and implemented during the appropriate phase of construction and prior to facility operation to address potential spills, prevention measures, and response procedures that would be followed should a spill occur. During operation, regulations require the SPCC plan to be reviewed and updated, as appropriate, at least every 2 years. The plan must be stamped by a registered professional engineer.
- A Spill Prevention and Emergency Cleanup Plan will be designed to assist on-site workers with accidental releases of on-site hazardous substances. Any large spill would require emergency response through the local fire department or designated contractor.
- During fire season, a water truck equipped with a sprayer would be located on site during construction activities.
- During Project construction and all Project welding operations, the Applicant would have a readily accessible water truck and chemical fire suppression materials available on site to allow immediate fire response.
- The Applicant would provide Project staff with cellular or on-site phones to enable timely communication with the fire department and other emergency services.

- Fencing would be used as appropriate and signs would be posted to warn of electrical dangers with emergency contact numbers, e.g., phone numbers of emergency responders.
- The Applicant would monitor the site for evidence of unauthorized use and provide additional security as appropriate.

3.9 Roads and Transportation

This section describes the existing transportation network in Klickitat County near the towns of Bickleton and Roosevelt, Washington, that would serve the Project. It evaluates the potential impacts from construction and operations traffic using the local and regional roadway system. This section also identifies mitigation measures to limit these impacts.

3.9.1 Study Methodology

The analysis in this section is based primarily on information provided by the Washington Department of Transportation (WSDOT) and Klickitat County Public Works. Information from other sources used to evaluate the potential impacts associated with the Project have been referenced.

Daily traffic volumes and truck percentages on state highways were gathered from the most recent version of the Annual Traffic Report published by WSDOT (WSDOT 2016) and the WSDOT Traffic Geoportal map interface for traffic data after 2016 (WSDOT 2018a).

Vehicle trips that would be generated during construction of the Project was based on the anticipated construction material needs, construction workers, and support staff. During operation, trip estimates were based on the number of proposed employees and daily material needs.

A summary of past traffic accident rates in Klickitat County on county and state roads was based on the most recent 3 years (2016 to 2018) of traffic accident data available from WSDOT (WSDOT 2018a).

Existing state transportation plans and local comprehensive plans were reviewed to identify pertinent policies, impact evaluation criteria, and planned roadway improvements that could affect the Project vicinity.

3.9.2 Affected Environment

The Project area is in rural Klickitat County, Washington, north of the Columbia River between the communities of Bickleton to the north and Roosevelt to the south.

3.9.2.1 Existing Road Network

The Project identified a primary transporter route and an alternate transporter route to serve the Project area. A map of proposed routes is provided in Figure 3.9-1. Transporter routes are major roads used to bring equipment, materials, and labor to the Project area. Within the Project area, construction crews would use either local county roads or site access roads (which may be newly constructed and improved gravel-surfaced roads) that run from the county roads to and between the solar arrays, substation, and O&M facility.

Specific transporter routes were identified for truck traffic based on the assumed origin of equipment, materials, and personnel required to complete the Project. These transporter routes would be evaluated for size, weight, or height restrictions imposed by WSDOT prior to Project construction.

The primary transporter route for heavy and light duty trucks begins at SR 14 just northeast of the town of Roosevelt, Washington. The route then continues northeast up East Road/Roosevelt Grade Road to reach Project-area access roads. From East Road/Roosevelt Grade Road, vehicles would use Middle Road to access the solar arrays, substation, and O&M facility. Wood Gulch Road provides an alternative route to Middle Road from SR 14; however, there is no direct connection to East Road north of the Roosevelt Regional landfill, so it is unlikely this alternate route would be used.

Roosevelt Grade Road is classified as a major collector and is maintained by Klickitat County. This road is an all-season, two-lane, paved, and undivided north-south roadway with a posted speed limit of 50 mph. From Roosevelt Grade Road, another county roadway that would be used for access is Middle Road, a two-lane, paved, undivided, north-south collector roadway with posted speed limits of 50 mph or less.

Personnel vehicles would also access the Project area via the primary route. From the west and east, these vehicles would be able to use SR 14 to access the Project area via Roosevelt Grade Road; from the north, they would use Middle Road.

The WSDOT road classification system classifies SR 14 within the vicinity of the Project as a rural collector roadway with rolling terrain. This road has a posted speed limit of 65 mph and is a two-lane, east-west, undivided roadway with paved shoulders up to 7 feet wide. There is no designated parking along SR 14, and there is minimal access to the roadway.

Roosevelt Grade Road is paved, and Middle Road is graveled, and their conditions may vary with the season. For the Project, some county roadways may require repairs or upgrades to assist with construction activities.

3.9.2.2 Traffic Volumes

Table 3.9-1 shows the average daily traffic (ADT) volumes at various locations on the transporter routes in the study area for the most recent 5 years available (2013 through 2017). These volumes are based on the most current available traffic data from WSDOT (WSDOT 2016, 2018a). Klickitat County does not have historical traffic data for the roadways along the transporter routes.

3.9.2.3 Roadway Conditions

Roadway conditions may influence traffic safety issues. Poor pavement with potholes could cause motorists to swerve, resulting in unsafe vehicle operation. A review of roadway conditions for the transportation route indicates that, except for unimproved gravel county roadways near the Project, most of roadways proposed for the state highway transporter routes are in good condition. The gravel road leading to the existing Big Horn O&M facility would need to be improved if that facility is used for the Project. These gravel road segments will be evaluated before and after

construction of the Project to determine what, if any, degradation has occurred. The roadway would be repaired to pre-construction conditions or better. Regardless of existing pavement conditions, roadway segments would be reviewed prior to any added construction traffic, and a system for monitoring safety or degradation to pavement would be developed for the necessary roadways prior to construction.

Table 3.9-1. Average Daily Traffic Volumes and Estimated Truck Percentages on Project Roadways

Roadway	Function Class	2013 ADT	2014 ADT	2015 ADT	2016 ADT	2017 ADT
SR 14, MP 100.66 after JCT SR 14 Spur at Maryhill	1	640	680	770	520	NA
SR 14, MP 102.27, at Permanent Traffic Recorder Location R077	2	1,600	1,600	1,600	1,500	1,400
SR 14, MP 121.15, before JCT Rock Creek Road	2	1,200	1,200	1,300	1,300	1,200
SR 14, MP 131.07 after JCT Old Hwy. 8	2	1,400	1,300	1,400	1,400	1,200
SR 14, MP 148.95 before JCT Alderdale Boat Launch Road	2	1,100	1,100	1,200	1,200	1,200
Roosevelt Grade Road	NA	NA	NA	NA	NA	NA
Middle Road	NA	NA	NA	NA	NA	NA

Notes: The 2017 SR 14 ADTs from WSDOT Traffic GeoPortal were provided at mileposts different from those used for previous data; therefore, the data in this table have been extrapolated between mileposts for 2017.
ADT = average daily traffic (number of vehicles)
MP = mile post
JCT = Junction
NA = not available

3.9.2.4 Regulatory Framework

The Klickitat County roads and SR 14, as identified above, would comprise the primary public haul route used during construction and operation of the Project. The regulatory framework for transportation in Klickitat County consists of Project planning, design standards related to roadway geometry and paving materials, load limits for bridges and roadways, and weight limits or closures under defined circumstances. The planning and programming of public roads are included in the Klickitat County 2018 Six-Year Transportation Improvement Program (Klickitat County 2018b) and the 2018 Annual Road Program (Klickitat County 2018c). The County Transportation Standards (Klickitat County 2018d), which are included in the Klickitat County Code, state the minimum requirements for public and private road construction within the county, as well as any exceptions to these standards. All new public road and bridge construction must also be in accordance with the current edition of WSDOT's Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT 2018b). In addition, under Klickitat County Zoning Code 2.30:10.2, a Road Impact Assessment and a road haul agreement are required prior to construction of the Project. This

analysis provides a Road Impact Assessment that can be used as the basis for the road haul agreement to be negotiated separately.

3.9.2.5 Roadway Limitations

Roads serving the Project area may have permanent or temporary roadway restrictions, which are included in Klickitat County Ordinance No. 0111604 “Transportation Standards” of the Klickitat County Code. Chapter 12.40, “Special Restrictions,” specifies load, speed, and weight restrictions on Klickitat County roads during load-sensitive periods. These include any weather conditions that could affect traffic on county roads, such as ice, snow, and fog. It also authorizes the county engineer to issue emergency permits for the operation of vehicles exceeding the allowable gross load.

The following portions of the RCW limit the size of undivided and public roads:

- RCW 46.44.010 Outside width limit
- RCW 46.44.020 Maximum height—Impaired clearance signs
- RCW 46.44.030 Maximum lengths
- RCW 46.44.034 Maximum lengths—Front and rear protrusions
- RCW 46.44.041 Maximum gross weights—Wheelbase and axle factors
- RCW 46.44.042 Maximum gross weights—Axle and tire factors

RCW 46.44.090, “Special Permits for Oversize or Overweight Movements,” allows for special permits to be issued for vehicles exceeding the maximum size/weight/load limits specified in the RCW sections listed above. From RCW 46.44.041, the maximum legal load is specified as 105,500 pounds. Because some construction transport vehicles related to the Project may exceed this weight limit, a special permit in accordance with RCW 46.44.090 may be required prior to construction.

3.9.2.6 Existing Roadway Level of Service

Level of service (LOS) generally describes operating conditions on a roadway based on a variety of measures, such as delay, speed, and density. There are six LOS classifications, each given a letter designation from A through F. LOS A represents the best operating condition: little to no delay, and movements are not influenced by other vehicles on the roadway. LOS F represents the worst operating condition: long delays and congestion. The existing LOS for roadways surrounding the Project area is LOS C or better, which represents generally smooth traffic conditions. Under these conditions, individual users feel unrestricted by the presence of others in the traffic stream.

3.9.2.7 Roadway Hazards

This section provides information on traffic accident history in the Klickitat County for the most recent 3 years of available data (between 2016 and 2018) on county roads and state routes. Table 3.9-2 shows WSDOT Collision and Analysis Branch accident history statistics for this period in Klickitat county (WSDOT 2018a). These rates were then compared with statewide average statistics for similar roadway classifications.

Table 3.9-2. Traffic Accident Statistics for the Years 2016 through 2018

Location/Roads	Number of Traffic Accidents		
	2016	2017	2018
Klickitat County			
County Roads	69	83	85
State Routes	192	219	141
Statewide			
Statewide County Roads	15,099	15,149	13,272
Statewide State Routes	55,889	54,079	48,553
Source: WSDOT Collision and Analysis Branch (WSDOT 2018a)			

Field investigations would be conducted prior to construction to evaluate motorist sight distance and adequate signage. Because large trucks are expected to traverse these rural routes, safety concerns related to speed and roadway width would be addressed.

3.9.2.8 Future Plans and Projects

The Klickitat County Public Works Six-Year Transportation Improvement Program does not identify any Project-related roads as designated for improvement. No planned projects were identified by WSDOT near the Project area.

3.9.2.9 Public Transportation

Klickitat County does not have regularly scheduled public transportation. Because of its primarily rural location, limited public transportation is provided by Mt. Adams Transportation. Mt. Adams Transportation operates a dial-a-ride service for eligible county residents who need to access necessary medical, social, and human service appointments; educational opportunities; shopping; and other essential services. This service is volunteer based and relies on donations and public funding.

3.9.2.10 Air Traffic

Klickitat County is served mainly by two public airports. The nearest airport is Goldendale Municipal Airport in Goldendale, Washington, approximately 45 miles northwest of the Project along U.S. 97. The Columbia Gorge Regional/The Dalles Municipal Airport in The Dalles, Oregon, also serves Klickitat County. The Dalles is located approximately 55 miles west of the Project area along Interstate 84. This airport is limited to mainly private and charter plane service. Arlington Municipal Airport in Oregon is located across the Columbia River from the Project area. This is a public airport and serves mainly local air traffic.

3.9.2.11 Rail Traffic

Burlington Northern Santa Fe Railroad operates an active main line along the Columbia River from the Vancouver, Washington, area eastward to Wallula, where the line continues northwest through Yakima or northeast through Spokane. This line passes through Klickitat County, with a station at

Roosevelt near the Project. Rail is not expected to be used to transport any of the equipment or materials necessary for construction or operations.

3.9.2.12 Waterborne Traffic

The Port of Klickitat operates two industrial parks along the Columbia River: at the 52-acre Bingen Point Industrial Park in Bingen, and at the 660-acre Dallesport Industrial Park in Dallesport. Waterborne traffic on the Columbia River consists mainly of grain commodities. Barges are not expected to be used to transport any of the equipment or materials necessary for construction or operations.

3.9.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. Existing roadway hazards, public transportation, air traffic, rail traffic, and waterborne traffic would continue.

3.9.4 Impacts of the Project

3.9.4.1 Construction Impacts

Project construction is assumed to occur over a period of 9 to 12 months. Potential impacts that could result from construction of the Project are evaluated in this section. Vehicle trip generation was estimated based on the expected construction materials and equipment needed for the Project. Truck estimates for solar panels, concrete, gravel, and electrical materials were provided by the Project owner.

Construction Traffic Volume

Project construction is anticipated to begin in 2019 and is expected to last for 9 to 12 months. It is anticipated that most of the construction workers would access the site from within 70 miles of the Project. These local workers most likely would be from the west (Goldendale, Washington, or The Dalles, Oregon). Workers could also come from the east, in the Tri-Cities area of Washington.

The Project would be expected to generate approximately 26,500 one-way trips. On the basis of truck estimates from the Project owner, approximately 16,920 of these trips would be commuting trips by construction workers and Project management staff. Road aggregate is responsible for the largest portion of the 9,700 heavy-duty trucks, and these trips would likely be primarily within the Project area. Construction equipment deliveries account for a small number of the trips. This is a conservative estimate that assumes large trucks would be necessary for delivery of solar panels, equipment (such as bulldozers and loaders), and materials not available on site (such as water, concrete, and gravel). The weight, width, and height specifications of the actual trucks to be used are not available at this time but would be provided to the county prior to construction activities.

During the construction period, a maximum workforce of 350 construction workers is estimated. Of the 350 workers, assuming an occupancy of 2 survey workers per survey vehicle and an occupancy of 1.5 for other commuting vehicles, approximately 188 round trips would be expected for

commuting. Also, assuming that approximately 100 of the workers are driving delivery trucks, approximately 96 material delivery trucks could be expected per day.

During peak hours of construction, approximately 118 commuter and delivery trucks per hour could be expected. The approximate peak hourly volume of 118 trips is a conservative upper bound based on all of the commuting trips occurring in 1 hour and 25 percent of the delivery trips taking place in the same hour. Based on a total workforce of 350, the highest peak hourly volume would be approximately 190 trips. Because traffic congestion is determined by the peak hourly volume, the focus is on each single direction since the commuting trips are all in the same direction in the morning and in the afternoon. The total increase in daily volume would be an average of 380 one-way trips (190 vehicles) per day.

To assess potential impacts, it was assumed that all construction trucks would use the primary transporter route from SR 14 to Roosevelt Grade Road to access the Project area. While personnel would likely use SR 14 from both directions, to conservatively assess traffic impacts, it was assumed that all personnel vehicles would come from the east. This analysis would represent the worst-case scenario for traffic impacts, because it is likely that personnel would actually arrive from both directions on a given construction day. To gauge the level of impact from the additional traffic, the total volume (i.e., ADT) of traffic was evaluated, along with the peak hour traffic for the assumed transportation route.

The total increase in ADT on the roadways during construction is estimated to be 380 daily trips. Assuming similar volumes during the year of construction, the Project would cause an increase in daily traffic of approximately 32 percent on SR 14. The current traffic counts for Roosevelt Grade Road and Middle Road are not available. However, given the rural nature of the area, these roads would see a large increase in daily traffic. Although the daily volumes on some Project roadways would increase dramatically, the existing daily volumes are low, and the roadways have ample capacity. Temporary delays may occur on Roosevelt Grade Road because of the reduced ability of vehicles to pass delivery vehicles with large loads (e.g., construction equipment), but these large loads would account for a small proportion of the overall number of trucks. Therefore, the temporary addition of an additional 380 construction-related trips, spread over the typical workday, is not expected to significantly affect driving conditions or cause backups and significant delays.

Because workers are anticipated to remain on site all day, it is assumed that the 94 worker commute trips would take place during the morning and afternoon peak hours. These construction worker trips would consist mainly of light-duty vehicles and automobiles. As previously discussed, approximately 118 delivery and commuter trucks could be expected during the peak hour of construction. Construction traffic is not expected to degrade operations on local county roadways.

Roadway Limitations

The construction of the Project could be affected by seasonal roadway restrictions in the winter and early spring. Seasonal road restrictions imposed by the county would limit construction activities to

the spring, summer, and fall. However, these restrictions are not anticipated to affect the construction schedule.

The construction of the Project could cause roadway damage as a result of heavy or large loads. Heavy trucks along transporter routes could raise concerns about the deterioration of roadway pavement. Existing conditions on state roads are assumed to be good, but county roadways may require improvement before construction activities begin. County roadways would, to the extent possible, be restored to their original condition once construction is complete.

The transport of solar panels along state highways is necessary because there is no source for these specialized components within proximity to the Project area. The required materials and equipment must be shipped into the region from a larger metropolitan area, such as Seattle or Portland. The only anticipated oversized delivery will be the substation main power transformer, which will require two oversize or overweight truck trips. Because these two large loads would be moved on public roadways, they would be coordinated with authorities and would comply with local and state requirements.

Prior to construction, a traffic management plan would be developed to address any planned county or WSDOT road restriction that may arise.

Roadway Hazards

The addition of construction-generated traffic by the Project is not anticipated to have a noticeable impact on the existing traffic accident rate or pattern on transporter routes. During construction, vehicles that are large and heavy would travel on SR 14, which may encourage motorists to attempt to pass using the lane of the opposite direction of travel. Attempting to pass these slow-moving vehicles could slightly increase traffic accident rates because of the potential of head-on collisions or sideswipe accidents as motorists attempt to pass.

SR 14 traverses winding geography and has steep side slopes in certain locations. These features could contribute to lower speeds for large vehicles and may cause limited sight distance for motorists attempting to pass.

During periods of inclement weather, some county roadways may be closed to traffic. Prior to construction, a contingency plan would be developed between the county and the developer. This plan would identify suitable alternate routes, if any, to the Project area during construction.

The Roosevelt School District surrounds the Project area. Because only one elementary school is located within the district, many older children must ride school buses to neighboring districts, such as Goldendale School District to the west and Bickleton School District to the north, to attend middle and high school.

School bus routes that overlap with transporter routes could introduce potential conflicts between heavy vehicles and school buses during construction. To minimize potential conflicts, construction vehicles would be strongly reminded to yield to school buses whenever their paths may meet. Potential conflicts with school buses could be avoided if construction vehicles lower their speed when approaching school bus stops, or when overlapping with school bus routes.

The Project manager would coordinate and agree on transporter routes with appropriate county staff before construction startup. County staff would also be consulted to determine a method of documenting preconstruction road conditions and develop a reimbursement plan for roadway degradation damages during construction.

3.9.4.2 Operational Impacts

Direct impacts on the surrounding area at completion of the Project are evaluated in this section. If constructed, the Project would have a service life of up to 50 years.

The Project would employ up to three full-time workers during core operating hours. The operations crew would staff the Project for typical 8-hour workdays, Monday through Friday, with additional hours on weekend shifts as required. Assuming that all workers would leave the site at the same time at the end of the workday, a maximum of three worker trips would be added to peak-hour background traffic. It is anticipated that Project operations crews would drive light trucks and vans on site to perform maintenance and supervision activities.

Vehicular access to the Project area would be provided mainly via SR 14, which runs east-west along the north (Washington) side of the Columbia River. From SR 14, vehicles would take Roosevelt Grade Road north to the Project area and then use local roads to access the facility. Vehicular access from Bickleton would occur on Middle Road.

Because of the rural nature of Klickitat County, the minimal amount of traffic-generating developments anticipated within the area, and the addition of only a few full-time workers during operation of the Project, there would be minimal impact on the roads and traffic in the area.

Roadway Limitations

The operation of the Project would have little impact on the condition of the public road system. Although large vehicles would be required for delivery and installation of various maintenance-related items, continual heavy truckloads would not be required on a daily basis. Replacement of solar panels may occur over time with scheduled maintenance.

Parking

During the operations phase, a limited number of parking spaces would be provided at the O&M facility parking lot. The Project would not eliminate any parking spaces.

Roadway Hazards

Traffic generated by the operation of the Project is not anticipated to affect traffic accident rates on transporter route roadways. Heavy, slow-moving vehicles would not be expected on a daily basis on SR 14 or the transporter route roadway during Project operation. Conflicts between large trucks and school buses or bus stops would also not be anticipated. The proposed site accesses along county roadways would provide adequate sight distance for vehicles entering and exiting the roadway. Figure 3.9-1 shows most of the county roadways that would be used for transport.

3.9.4.3 Indirect Impacts

Indirect or secondary impacts from Project operations traffic are not anticipated. Because the Project is not expected to generate substantial regional growth, traffic volumes are not anticipated to be substantially greater than projected future volumes.

3.9.5 Mitigation Measures

No significant unavoidable adverse impacts on traffic and transportation would be associated with construction or operation of the Project. However, the following mitigation measures are proposed during Project construction:

- In accordance with Klickitat County Zoning Code, a Road Haul Agreement will be prepared in consultation with the county Public Works Department to address impacts to county roads.
- Project manager and county staff would meet prior to construction to outline steps for minimizing construction traffic impacts, including conflicts where state-imposed roadway restrictions would affect transporter routes.
- Notices to adjacent landowners would be distributed when construction takes place to help minimize access disruptions.
- All construction vehicles would yield to school buses and would lower their speed when approaching a school bus or bus stop along their transport routes.
- Advance warning and proper roadway signage would be placed along SR 14 to warn motorists of potential vehicles entering and exiting the roadway. Signage would include “Equipment on Road,” “Truck Access,” or “Road Crossings” along SR 14.
- When slow or oversized wide loads are being hauled, appropriate vehicle and roadside signage and warning devices would be deployed per the traffic management plan. Pilot cars would be used as WSDOT dictates, depending on load size and weight.
- Site-access roads and an entrance driveway would be constructed to service truck movements of legal weight and provide adequate sight distance.
- Carpooling among construction workers would be encouraged to reduce traffic volume to and from the Project area.
- Detour plans and warning signage would be provided in advance of any planned traffic disturbances.
- Flaggers would be employed as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents.
- One travel lane would be maintained at all times, if possible. If lane closure must occur, adequate signage for potential detours or possible delays would be posted.
- O&M of the Project would not significantly affect traffic. No mitigation measures are proposed during Project operation.

3.10 Recreation, Housing, and Public Services

This section identifies formally designated recreation areas and other recreational activities within the vicinity of the Project, and evaluates potential impacts to such activities that could result from the Project's construction and operation. In addition, this section summarizes current housing availability in nearby communities and the potential impacts to housing availability during construction and operation of the Project.

3.10.1 Study Methodology

The study area for recreation and housing resources included the area within the solar facility siting area and local vicinity (approximately 10 miles from the solar facility siting area), with additional information for Klickitat County as relevant to the analysis. Existing recreation areas were researched through aerial photography, publicly available map data, and applicable government agency information (USACE 2018). Potential impacts were determined based on whether the use or enjoyment of any recreation area or activity would be directly or indirectly affected by the Project.

Current community and housing information was gathered from the U.S. Census Bureau American Community Survey 5-year Estimates (2013 through 2017; U.S. Census Bureau 2017). These estimates provide the most recent community information prior to the next decennial nationwide census. In addition to population size, the U.S. Census Bureau survey provides data for housing unit vacancies (to own or rent) that can be compared with potential Project demand. A desktop search was also conducted to gauge temporary housing availability, such as hotels/motels, recreational vehicle (RV) parks, and campgrounds. Based on the overall local housing supply, the Project was evaluated to determine whether potential housing demand from construction and operations would adversely affect local housing availability.

3.10.2 Affected Environment

3.10.2.1 Recreation

Overall, the Project vicinity does not receive large numbers of recreationists. No local, state, or federal recreation areas are located within the solar facility siting area or within 5 miles of the solar facility siting area. Based on available information, the private and WDNR land within the solar facility siting area is not open for recreational hunting because it is used for cattle grazing and rural residences (see Section 3.11, Land Use). While dispersed seasonal hunting can occur outside of the solar facility siting area, most recreation and tourism-oriented activities in the vicinity occur along the Columbia River corridor, located approximately 3 to 8 miles south of the solar facility siting area. Along the Columbia River corridor, recreationists use the river for fishing, boating, or other water sports, and driving tourists use SR 14 (also known as the Lewis and Clark Trail Highway). The Lewis and Clark Trail Highway was a designated Washington State Scenic Byway, and while it is still enjoyed as a scenic travel route, the scenic byway program is no longer active due to the elimination of federal funding (WSDOT 2019). At its closest point, the Lewis and Clark

Trail Highway is approximately 3.5 miles southeast of the solar facility siting area, moving further away from the Project as it continues west. The closest public park is also in the Columbia River corridor, the Roosevelt Park Recreation Area in the community of Roosevelt (about 6 miles south of the solar facility siting area). The Roosevelt Park Recreation Area is a USACE recreation site used primarily for fishing and windsurfing, and includes bathrooms, a boat ramp, non-reservable camping spots, and picnic shelters (USACE 2018).

3.10.2.2 Housing

Klickitat County has a relatively small population among Washington state counties, ranking 29th out of 39. As of 2017, Klickitat County's population was estimated to be 21,172 (U.S. Census Bureau 2017). There are three communities within 10 miles of the Project, including Bickleton and Cleveland to the northwest, with a combined population⁵ of 67 (U.S. Census Bureau 2017), and Roosevelt to the south, with a population of 107. Goldendale is the closest small city, located approximately 30 miles to the west of the solar facility siting area, with a population of 3,433 (U.S. Census Bureau 2017).

Total housing units and the vacancy rate for Klickitat County and each community is presented in Table 3.10-1. Temporary housing, such as in hotels, motels, RV parks, and campgrounds, is not included in the housing unit estimates. Goldendale would be the closest community where such temporary housing is available, including three motels (about 100 total rooms) and an RV park. Other hotels and motels are farther away from the solar facility siting area but still within an hour drive, for example in the towns of Toppenish and Prosser. Additional camping spots are available along the Columbia River, including at the Roosevelt Park Recreation Area approximately 6 miles south of the solar facility siting area, as noted in Section 3.10.2.1.

Table 3.10-1. Housing Units and Vacancy Rate

Location	Total Housing Units ^{1/}	Vacancy Rate
Klickitat County	10,196	19%
Goldendale City	1,603	9%
Roosevelt	55	24%
Bickleton (and Cleveland)	30	13%
Source: U.S. Census Bureau 2017. 1/ The Census Bureau defines a housing unit as a house, an apartment, a group of rooms, or a single room occupied or intended for occupancy as separate living quarters.		

3.10.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed, and the recreation and housing impacts described in this section would not occur. Pending the proposal of other significant or influential development in the area, recreational use and the housing market would likely continue the same trend that currently exists.

⁵ Cleveland is part of the Bickleton Census Designated Place, for which population numbers are tracked by the U.S. Census Bureau.

3.10.4 Impacts of the Project

3.10.4.1 Direct Impacts

Recreation

As discussed above, there are no local, state, or federal recreation areas within the Project lease boundary or within 5 miles of the lease boundary, and dispersed seasonal hunting is not permitted within the Project lease boundary. Therefore, the Project would not directly displace any recreational resource. Use of area roads for Project construction and operation is not expected to delay or block access to any recreational resource along the Columbia River corridor or dispersed activity such as hunting (see Section 3.9, Roads and Transportation). Noise from Project construction and operation would not be audible from any recreation area (see Section 3.1, Noise). It is possible that seasonal hunters may hear some construction noise if they are within a half mile of the Project area during daytime construction activity, though this is unlikely given the primary agricultural and wind energy land uses within a half mile of the Project (see Section 3.11, Land Use). If there were an overlap with hunting, it would be a minor, temporary impact. The Project would not be visible from any designated recreation area or general recreational use along the Columbia River corridor (see Section 3.7, Aesthetics, Light, and Glare). For these reasons, no significant adverse impacts to recreation are expected from Project construction and operation.

Housing

An estimated maximum of 350 workers would be employed to construct the Project. During construction, out-of-area workers are not likely to move their families to the small communities near the Project area because construction is expected to last only 9 to 12 months. Workers would either commute or stay in temporary housing (such as RV parks, hotels, motels, or campgrounds) for the period needed to complete their tasks. As detailed in Section 3.10.2.2, given the variety of temporary housing options in Goldendale, other towns within commuting distance, and additional camping along the Columbia River, no shortage in temporary housing availability is anticipated from the low level of Project demand.

During operation, the Project may employ up to three full-time employees. These staff may or may not reside in the Project vicinity or farther away in Klickitat County on a full-time basis. Based on the vacancy rates provided in Section 3.10.2.2, there would be sufficient housing available if all three employees chose to live in the area. Therefore, no adverse impacts to housing are expected from Project operations.

3.10.4.2 Indirect or Secondary Impacts

Indirect impacts occur later in time or farther away than direct impacts, but are still reasonably foreseeable. Given the low level of recreational activity that is primarily located more than 5 miles away from the solar facility siting area, and the minimal human presence induced by the Project, no indirect or secondary impacts to recreation are anticipated.

Future supply and demand for housing in the Project vicinity and Klickitat County is likely to follow current trends. Three potential new residents, resulting from new permanent workers at the project, would not significantly affect future supply or demand for housing, and the Applicant does not expect to increase its local full-time staff over the life of the Project beyond three permanent staff. Therefore, the Project would not have adverse indirect or secondary impacts to housing.

3.10.5 Mitigation Measures

Because the Project would not have a significant adverse effect on recreation or housing availability, no mitigation measures are proposed.

3.11 Land Use

This section describes the current land use and zoning in the Project vicinity. It also evaluates potential impacts to land use from construction and operation of the Project. Mitigation measures are identified, where appropriate, to reduce or avoid these impacts.

3.11.1 Study Methodology

Existing land use was researched through aerial photography as well as the land use and zoning designations established by Klickitat County (Klickitat County 2018e). Potential impacts were determined based on whether the quality and character of existing land uses within and adjacent to the Project would be affected. The Project was also evaluated to determine whether construction and operations would be consistent with the county's zoning code.

3.11.2 Affected Environment

This region along the Columbia River is sparsely populated and contains few towns or other developed areas. The nearest community is Bickleton, located about 7 miles north-northwest of the Project, with a population of 67 (U.S. Census Bureau 2017). There are three residences within the lease boundary that are excluded from the solar facility siting area, and one residence within a mile of the lease boundary (located in a small internal triangle cut out from the lease boundary). No residences are within a mile of the outer lease boundary line.

The Project area is located immediately south and east of the existing Big Horn Wind Project, and southwest of the existing Juniper Canyon Wind Project. Both existing wind facilities are owned and operated by the Applicant. The Project's solar facility siting area would overlap with portions of these facilities, although only turbines from the Big Horn wind facility fall directly within the solar facility siting area.

The land within the solar facility siting area is primarily private, with one parcel within the Project area owned by WDNR. The WDNR property is Common School trust land; revenue generated on these lands helps fund K-12 school construction projects across the state (WDNR 2018c,d).

Current land use in the vicinity of the Project consists of agriculture, including irrigated cropland, dryland wheat farming, and undeveloped rangeland for grazing. There are also small areas of

residential and undeveloped government property in the area. Figure 3.11-1 depicts the current zoning and land use within the region around the Project, the lease boundary, the solar facility siting area, and the Project area. Zoning is discussed below under “Regulatory Framework”. As different land uses are permitted within the same zone, either outright or through the conditional use permit process, the county assigns a land-use code at the parcel level to track current land use separately from the underlying zone.

Within the solar facility siting area, the dominant land use is coded agricultural in the county database (Klickitat County 2018e). The main agricultural activity is rangeland for grazing cattle, and parcels include, as noted above, some of the wind turbines from adjacent wind energy facilities. The WDNR “service – governmental” parcel is currently undeveloped and has been leased for grazing and the small portion coded by the county as “residential land – undivided” is also undeveloped open space potentially used for grazing.

Regulatory Framework

The entire Project area is within the EOZ, and the Klickitat County zoning ordinance designates the full area within the Project lease boundary as Extensive Agriculture (Klickitat County 2015; see Figure 3.11-2). According to the Klickitat County zoning code, areas within the EOZ are suitable for energy resource operations based on the availability of energy resources, existing infrastructure, and locations where energy projects can be sensitively sited and mitigated. The Klickitat County Energy Overlay Final Environmental Impact Statement (Klickitat County 2004) evaluated potential impacts of solar energy development within the EOZ. Operations permitted through the EOZ are subject to the standards of the EOZ rather than the standards of the underlying zone.

Although a permit is required from Klickitat County, the standards for the EOZ allow solar arrays and accessory buildings and structures needed for operation, including utilities and utility infrastructure required for the principal use. Siting criteria, an individualized review, and the imposition of conditions based on site-specific information are part of the permit process. The permit also mandates compliance with mitigation conditions developed in accordance with the requirements contained in the EOZ standards and county procedures.

The Klickitat County Critical Areas Ordinance (Klickitat County 2013) establishes regulations pursuant to the critical areas requirements of the Growth Management Act RCW Chapter 36.70A. These provisions apply to all activities, unless specifically exempted, and function as an overlay on existing land-use regulations, including the EOZ. Critical areas include wetlands, critical fish and wildlife habitat conservation areas, geologically hazardous areas, aquifer recharge areas, and frequently flooded areas. Each of these are addressed in their respective resource sections (see Section 3.3, Vegetation and Wildlife, Section 3.4, Wetlands and Water Resources, and Section 3.5, Geologic and Flood Hazards).

3.11.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed or operated. The No Build Alternative assumes that future development would comply with existing zoning requirements

within the region, which is zoned Extensive Agriculture within the EOZ. Current land-use patterns are expected to continue. Because the area is contained within the EOZ, other large-scale energy projects could be proposed for the area in the future.

3.11.4 Impacts of the Project

3.11.4.1 Construction Impacts

During construction, the Project would temporarily increase traffic on roads in and around the Project. Construction schedules and equipment access would be coordinated with adjacent landowners to ensure that any existing activities would not be adversely affected. Once construction is complete, operational traffic to and from the Project would be minimal. Section 3.9 provides further information on potential transportation impacts. The Project would comply with Washington noise rules at all locations to avoid or minimize impacts to the residences in proximity to the solar array, substation, transmission line, and other Project components. Section 3.1 provides a detailed analysis of potential sound impacts.

3.11.4.2 Operational Impacts

With construction and operation of the Project, the Project area would be converted from its current uses to land used for the solar facility, including land occupied by Project infrastructure and remaining open space enclosed by the Project fence line. This impact is allowed by the EOZ and is consistent with existing renewable energy development within and adjacent to the Project lease boundary. While the Project is not expected to convert any active cropland areas, it would convert rangeland used for grazing to a non-agricultural use. For the WDNR parcel within the Project area, the Applicant is currently working with WDNR to execute a lease for their property. As completion of the SEPA process is a prerequisite to executing the lease, the Applicant has not yet confirmed land control for this parcel. The micrositing process would allow Project elements to be shifted off WDNR land if the lease is not executed. Lease agreements with other Project area landowners would address the impact of forgoing use of the area that would be occupied by Project facilities.

The Project facilities would permanently disturb up to approximately 1,871 acres within the Project area fence line. However, sensitive resources, such as streams and rare plant communities, would be avoided to the extent possible in final Project micrositing (see Section 3.3, Vegetation and Wildlife, and Section 3.4, Wetlands and Water Resources). As noted earlier, much of the solar facility siting area is currently used for grazing cattle. Conservatively assuming the 1,871-acre Project area is all potentially open for grazing, the Project could displace approximately 317 to 475 cows to other grazing lands. This estimate is based on Project area landowner and leaseholder knowledge, approximating 4 to 6 acres per cow per month. As any given area can only be grazed once a year, the range of displaced cows is for 1 month of grazing in the Project area. Averaged over a full year, the Project would displace 27 to 40 cows for 1 year by removing 1,871 acres from the grazing rotation. The acreage required per cow for grazing in the Project area is larger than other more heavily vegetated areas because forage is often sparse in between shrubs (see Section 3.4, Vegetation and Wildlife). More precise land requirements for cattle depend on the average weight

of the cows, number of grazing days, productivity and seasonal growth pattern of forage, and other variables (NRCS 2009).

The Project area is not located within 200 feet of any Shoreline Management Act Zone; therefore, the shoreline master program is not applicable to the Project.

3.11.4.3 Indirect or Secondary Impacts

Indirect impacts occur later in time or farther away than direct impacts, but are still reasonably foreseeable. While the Project would not involve agricultural uses, the minimal human presence required to operate the facility is consistent with regional agricultural uses and with the continued mixed-use development of the region for both agriculture and renewable energy facilities. Solar lease payments to landowners would provide a stable source of supplemental income that could help residents stay in the area, or for WDNR, contributes to the common school trust system (Renewable Northwest 2018; WDNR 2018d). Therefore, no significant adverse indirect or secondary impacts are expected.

3.11.5 Mitigation Measures

Because the Project is consistent with the EOZ, no land use mitigation measures are proposed.

3.12 Public Service and Utilities

3.12.1 Study Methodology

A 10-mile radius around the Project area defines the boundary of the study area for public services and utilities. Using the Klickitat County and other relevant web sites, the Project team identified public services and utilities that have designated service areas, provide services, or would respond to calls within the study area. The Project team then evaluated potential effects of the Project by reviewing existing conditions and the Project design.

3.12.2 Affected Environment

The Project is on unincorporated land in Klickitat County. Public services and utilities within the study area include fire, police, medical services, schools, communication systems, sewage systems, solid waste facilities, water supply, stormwater systems, electricity lines, and natural gas lines.

3.12.2.1 Fire

The Project would be located within Klickitat County Fire Protection District No. 2 (i.e., Bickleton, north of the Project). Nearby fire protection districts located west, south, and east of the Project site include Fire Protection District No. 7 (i.e., Goldendale Rural), Fire Protection District No. 9 (i.e., Roosevelt), and Fire Protection District No. 10 (i.e., Alderdale), respectively. Fire Protection District No. 2 is staffed with 25 volunteer firefighters and covers an area of approximately 290 square miles. The district conducts wildland firefighting, but it does not have the equipment to fight structural fires. The district's equipment includes four brush trucks, two all-wheel-drive units, one

tender, and one ambulance. The district also works with District No. 7 out of Goldendale and District No. 10 out of Alderdale, which have 37 and 14 fire trucks, respectively. District No. 9 out of Roosevelt has 14 fire trucks. Klickitat County has developed a Draft Community Wildfire Protection Plan (Klickitat County 2018a) that identifies strategies and priorities for protecting life, property, and infrastructure. The plan designates Dot Road and East Road as ingress-egress routes serving eastern and south-central Klickitat County, connecting the Project with the Bickleton Highway and State Highway 14 along the Columbia River. These roads offer fire-escape options, which would require through-access to be maintained during Project construction and operation. Project employees would be required to familiarize themselves with the road layout within and outside the Project area.

WDNR land is located in the Project area, and the WDNR has wildland firefighting department located in the WDNR Southeast Regional Office in Ellensburg. However, the WDNR's department is not equipped or trained for handling structural fires.

3.12.2.2 Police

The Klickitat County Sheriff and Washington State Patrol District 5, Goldendale Detachment, provide law enforcement services within the study area. The Klickitat County Sheriff serves the unincorporated areas of Klickitat County, and the Washington State Patrol patrols SR 14, south of the study area. Law enforcement services provided by the Klickitat County Sheriff include traffic control, drug enforcement, search and rescue, and civil calls. The Washington State Patrol provides traffic enforcement on state highways, drug enforcement, and incident response. The Klickitat County Sheriff has 24 commissioned officers at full staff, including the sheriff, 19 deputies, 2 detectives, and 2 patrol sergeants. Each deputy has a minimum of several hundred hours of training, and all are certified through the Washington State Criminal Justice Training Commission (Klickitat County 2018f).

3.12.2.3 Medical Services

Klickitat Valley Hospital in Goldendale (a licensed 25-bed facility about 26 miles west of the solar facility siting area) serves central and eastern Klickitat County. The hospital has a LifeFlight medical evacuation service that enables air transfers of serious trauma patients to Legacy Emanuel Hospital in Portland, Oregon, the region's closest Level 1 Trauma Center with approximately 554 beds. Klickitat County Fire District No. 2 serves the study area with one ambulance. The ambulance is staffed with volunteer emergency medical technicians. In serious injury cases, the Fire District contacts an advanced life support unit. Advanced life support units that serve the area are LifeFlight, based in Portland, and Northwest MedStar, based in the Tri-Cities (Kennewick-Pasco-Richland, Washington).

3.12.2.4 Schools

Two schools are located within the study area: Bickleton School (kindergarten and grades one through twelve) and Roosevelt Elementary School (grades one through six).

Most of the study area is located in Bickleton School District No. 203. This school district, which includes only Bickleton Elementary and High School (located approximately 7 miles north of the solar facility siting area), has a current enrollment of 86 students and a capacity of about 120 students. Three Bickleton School District bus routes use roads in the study area.

The southern portion of the study area is located within Roosevelt School District No. 403. The Roosevelt School District has one school, Roosevelt Elementary, with a current enrollment of 27 students and a capacity of 44. Roosevelt Elementary is located approximately 7 miles south of the solar facility siting area. Roosevelt School District buses do not use roads in the study area. Students who are residents in this school district, but who attend school in the Bickleton School district (due to the lack of a high school in this district), are driven by their parents to the closest Bickleton School District bus stop near East Road and Six Prong Road.

3.12.2.5 Public Transit

Public transit is not available in the study area. Employees will commute independently or carpool to the Project.

3.12.2.6 Communications

Telephone, high-speed Internet, cellular telephone, and satellite television services are provided by various providers in the study area. Cellular service is available from a variety of providers, but reception within the study area varies with terrain. The closest cell tower (owned by Hood River Cellular Telephone Company) is located about 4 miles south of the Lease Boundary. Newspapers distributed in the study area are the Goldendale Sentinel and the White Salmon Enterprise.

3.12.2.7 Sewage

Sewer service is not available in the Project area. On-site septic systems are required for wastewater collection. The Project would collect sanitary wastes in portable toilets during construction. Following construction, sanitary wastes from the O&M facility would be collected by an on-site septic system.

3.12.2.8 Solid Waste

Allied Waste of North America provides solid waste disposal services, including recycling, in the study area. Garbage is transported to the Roosevelt Regional Landfill, located within the study area near the southeast corner of the Lease Boundary. Roosevelt Regional Landfill is the fourth largest landfill in the United States and is owned and operated by Allied Waste. Recycled materials are transported to the Rabanco Recycle Center in Seattle.

3.12.2.9 Water Supply

The study area is located within WRIA 31 (i.e., the Rock-Glade Creek watershed). Local residents rely on individual wells for water service. Water for the Project would be acquired from an on-site well drilled and operated in compliance with local and state requirements. The Wetlands and Water

Resources section (Section 3.4) presents a complete description of water resources in the study area.

3.12.2.10 Stormwater

Stormwater facilities in the study area consist of culverts and drainage ditches. Stormwater generally infiltrates directly into the ground.

3.12.2.11 Electricity

Klickitat Public Utility District (KPUD) No. 1 provides electrical power to all of Klickitat County. Most of the power provided by KPUD comes from the federal hydroelectric system through BPA. About 12 percent of the total power supplied by KPUD comes from the hydroelectric plant it owns, via a small turbine at McNary Dam on the Columbia River. The closest transmission lines to the Project site are those used by nearby wind energy projects such as Big Horn (to the north and west of the Project area) Juniper Canyon (to the northeast, that would share the use of their existing 230-kV transmission line), and the White Creek and Harvest Wind facilities (to the southwest). Five regional transmission lines are in the study area (see Figure 3.12-1).

3.12.2.12 Natural Gas

A 26-inch-diameter, high-pressure, natural gas transmission pipeline traverses Klickitat County from east to west, running through the southern end in the Project lease area (see Figure 3.12-1). The pipeline, operated by the Williams Pipeline Company and known as the “Evergreen Pipeline,” delivers gas from Colorado to population centers in western Washington and western Oregon. NW Natural provides natural gas to customers in Klickitat County.

3.12.3 Impacts of the No Build Alternative

Under the No Build Alternative, the Project would not be constructed. The electrical energy that would have been produced by the Project would need to be obtained from another source. There would be no Project-related effects on public services and utilities in the study area.

3.12.4 Impacts of the Project

This section identifies and evaluates expected effects associated with construction and operation of the Project. The evaluation includes fire and police protection, medical services, schools, communications, sewer systems, solid waste, water supplies, stormwater, electricity (transmission lines), and natural gas.

3.12.4.1 Construction Impacts

Fire Protection

The increased presence of construction workers (as many as 350 workers at peak) and construction activities in the study area could increase the risk of wildland fires, resulting in a higher volume of calls for emergency fire services than currently exists. Although extremely remote,

there is a small possibility for solar facility components to ignite during testing. Additionally, only four residences are within the lease boundary of the Project area. As a result, fire risk to people and property during construction would be minimal. The highest expected fire risks are from grass fires during summer. Implementation of emergency preparedness measures would minimize demand on emergency response services. Other steps would be taken to prevent fire during construction, such as establishing roads before accessing the site to minimize vehicle contact with grass, using diesel construction vehicles rather than gasoline vehicles to prevent potential ignition by catalytic converters, not allowing vehicles to idle in grassy areas, and restricting the use of high-temperature equipment in grassy areas. See Section 3.12.5, Mitigation Measures, for further measures that could be implemented.

Police Protection

Construction activities associated with the Project, including the commutes of construction workers and the transportation of materials, would increase traffic volume on roadways in and near the study area. It is expected that this increased traffic volume would occur for the full 9 to 12 months of construction. The number of accidents and calls for service could increase slightly during the construction period because of the increased number of personnel temporarily on site. A detailed discussion of traffic in the study area is presented in the Roads and Transportation section (Section 3.9).

Out-of-area workers are not likely to move their families to the study area because construction is expected to last only 9 to 12 months. Workers would either commute or stay in temporary housing (such as RV parks, hotels, motels, or campgrounds) for the period needed to complete their tasks. Because construction workers would not change their family residences, there is minimal population increase to the area and subsequent pressures on law enforcement.

There should be minimal need to increase civil law enforcement or to provide additional jail space. Because the construction period would be short, no increase beyond existing police staffing levels would be required to cover law enforcement.

Medical Services

Demand for emergency medical services could increase slightly because of accidents related to the number of temporary construction workers that could occur in the study area. Project construction workers could be exposed to hazards caused by equipment failure, natural disaster, or human error, and require the services of local emergency response units. With adequate safety measures in place, it is expected that Project construction would generate few, if any, serious injury accidents that would require an emergency medical service response. The Applicant would require construction contractors to prepare site health and safety plans, which would include locations of fire extinguishers, emergency telephone numbers, first aid techniques, nearby hospitals, and other pertinent information. The Applicant would brief local hospitals and emergency providers, including fire officials, and identify an emergency helicopter or aircraft landing area. Both the Klickitat Valley Hospital in Goldendale and the Legacy Emanuel Hospital in Portland have the ability to accommodate additional patients from the Project (capacities described in Section 3.12.2.3), and

ambulance and advance life support services are available in the study area. Consequently, there would be no significant effect on medical services in the study area during construction.

Schools

Because of the short length of the construction period, most construction workers from outside the area are expected to commute to the site from other areas, and those who do not would reside locally on a temporary basis. Consequently, no demand for additional teachers or other school personnel is anticipated during the construction period. No imminent increase in student enrollment is expected at schools within the study area.

Public Transit

There is no public transit within the study area, therefore no effects from construction are anticipated.

Communications

There would be no impacts on telephone, newspapers, or cable and satellite services in the study area during construction. As a solar facility, no interference with existing microwave telecommunication would occur. Furthermore, there are currently no cell phone towers in the Project area; therefore, the Project would not affect these systems.

Sewage

There are no sewage systems in the study area. Sanitary wastes would be collected in portable toilets during construction.

Solid Waste

During construction, the primary wastes generated would be solid construction debris such as scrap metal, cable, wire, wood pallets, plastic packaging materials, and cardboard. The waste would be accumulated on the construction site in dumpsters and/or drop boxes until hauled away to the Roosevelt Regional Landfill. Much of the construction waste would be recyclable (specific recycling program details would be developed by the construction contractor). The Roosevelt Regional Landfill is capable of accommodating the solid waste generated by this Project, therefore, there would be no significant effects on solid waste disposal sites or services.

Water Supply

Water for construction would be purchased by the construction contractor from a source with a valid water right and trucked to the Project area in tanker trucks. Water required for construction is estimated at an average of 100 gallons per acre per day. A detailed discussion of potential effects of the Project on groundwater is presented in the Wetlands and Water Resources section (Section 3.4).

Stormwater

During construction, BMPs would be applied to prevent runoff and suspended sediment from newly graded areas entering local ditches and waterways (see Section 3.4, Wetlands and Water Resources, for a list of BMPs related to erosion and sediment control).

Electricity

Construction of the Project would temporarily increase the demand for electricity in the study area; however, the level of demand would be well within the capacity of the local electricity provider (i.e., KPUD, who provides power to all of Klickitat County primarily through hydroelectric sources, as described in Section 3.12.2.11).

Natural Gas

Project construction would not require the use of natural gas. The natural gas pipeline located within the study area is not within the Project's proposed construction area footprint (see Figure 3.12-1); therefore, no direct effects to the pipeline are anticipated. If there were overlap due to a shift in the Project's layout, the contractor would coordinate with Williams Pipeline Company prior to construction to mark the exact location of the existing natural gas pipeline to avoid disturbance during construction.

3.12.4.2 Operational Impacts

This section evaluates expected direct effects of the Project's operation on public services and utilities. Because the Project would provide its own utilities, most direct effects would relate to public services, primarily fire and police protection within the Project area.

Fire Protection

All solar and electrical equipment would be inspected by the power utilities for grid and system safety prior to being brought on line. This, along with implementation of built-in safety systems, minimizes the chance of fire occurring due to Project activities. However, fire at these facilities could result from a lightning strike, short circuit, or mechanical failure/malfunction. Any of these occurrences affecting electrical operation in close proximity to the Project would be sensed by the SCADA system and reported to the Project control center. Under these conditions, the Project would automatically shut down and/or Project maintenance personnel would respond as appropriate.

Project personnel would be trained in fire response and would have the equipment to deal with particular emergency situations that may occur at the Project. Project personnel will contact local fire personnel for more skilled expertise only when necessary (e.g., working in confined spaces, high voltage, etc.). Consequently, such an incident would generally not expose local emergency service providers or the general public to any public health or safety risk. Mitigation measures for fire prevention and suppression, discussed later in this section, address this topic.

Police Protection

Over the long term, the demand for police services during Project operation could increase as a result of theft, vandalism, or trespass at the Project area. Such an increase in service demand, however, is expected to be minimal because security measures would be implemented during Project operation. Such measures would include installing chain-link fencing topped with barbed-wire around the Project substation and O&M facility, padlocking gates, and pad-mounting transformers.

Medical Services

Project operations are not expected to have significant effects on emergency medical service providers. The operations workforce for the Project would be small (i.e., up to three workers). Furthermore, the Project's O&M group would receive regular emergency response and safety training to reduce the likelihood of, and limit the effect of, emergencies at the Project. The local Klickitat Valley Hospital in Goldendale would be able to provide emergency care as needed and has the ability to air transfer serious trauma patients to Legacy Emanuel Hospital in Portland, the region's closest Level 1 Trauma Center.

Schools

Project operation would have no significant effect on schools. The operations staff would be small, (up to three people), and some of these individuals would likely be hired from the local community (i.e., this would minimize the amount of new staff relocating to the area). For the purposes of estimating effects, it is assumed that two staff would relocate to the area to work on the Project. On average, approximately half of relocating staff have school-age children. Assuming that the relocating staff would have on average two children, this would result in approximately two additional children who would attend local schools. The local schools have the capacity to accommodate these potential additional students. Therefore, Project operation would not affect bus routes or school facilities.

Public Transit

There is no public transit within the study area, therefore no direct effects are anticipated.

Communications

The solar array would not affect analog and digital television signals. In the unlikely event that a digital television receiver in the Project area experiences signal attenuation resulting in loss of signal, the Applicant would investigate complaints to determine if the problem is caused by the presence of solar facility or other Project facilities. If the Project is determined to cause interference, the Applicant would restore television coverage to the level that existed prior to the installation of the Project.

There would be no effects on telephone, newspapers, or cable and satellite services in the study area during operation. As a solar facility, no interference with existing microwave telecommunication would occur.

Sewage

Project operation would not produce sewage-related effects. An onsite septic system would be installed in accordance with Klickitat County and Washington state regulations.

Solid Waste

Because solid waste generation during Project operation would be minimal (approximately one dumpster load per week), there would be no significant effect on local solid waste facilities. The Roosevelt Regional Landfill is capable of accommodating the solid waste generated by this Project.

Water Supply

During Project operation, water use is expected to be less than 5,000 gallons per day. Water would be supplied by an on-site well for use in the lunchroom and bathroom in the O&M facility, and for incidental maintenance. Therefore, there would be no drawdown or other effect on existing wells in the study area.

Stormwater

Project operation would have minimal stormwater-related effect, because approximately 58.5 acres of existing pervious surface distributed throughout the 1,871-acre Project area would be converted to impervious or reduced-permeability surface, primarily resulting from the Project's concrete inverter skids, new graveled Project access roads, and concrete and gravel surfaces associated with the O&M facility and substation. Stormwater would be conveyed to new ditches or existing natural swales to infiltrate into the ground. The Project's operation would comply with NPDES requirements, which regulate stormwater. For more information on stormwater, see the Wetlands and Water Resources section (Section 3.4).

Electricity

During operation, the Project would consume low voltage (12 kV) service for O&M building lighting. This service would be provided through a contract with a local electrical service provider. The energy the Project would consume is less than 0.001 percent of the energy it generates. Therefore, there would be no effects on adjacent or other nearby electrical service facilities. Power from the solar array would be collected through an underground and overhead collector system and interconnected to the BPA grid via the existing 230-kV Juniper Canyon transmission line.

Natural Gas

There would be no effect on natural gas service in the study area, because the Project would not use natural gas or affect any natural gas facility.

3.12.4.3 Indirect and Secondary Impacts

The Project is not expected to result in any indirect effects on public services and utilities, because it is not expected to induce population growth, industrial development, or new access to existing undeveloped lands in the study area. The Project would be largely self-sufficient, providing most of

its own utilities, and would not affect the capacity of services provided to the local community in the future. The Project would employ approximately up to approximately three permanent full-time or part-time employees. Given the limited number of new residents brought to the study area by the Project, the expected future low growth rate in the study area, and the present capacity of public services and utilities, indirect effects on public services and utilities are not expected in the reasonably foreseeable future.

3.12.5 Mitigation Measures

Because Project construction would not produce adverse effects on fire and police protection, medical services, schools, communications, sewage, solid waste, water supplies, stormwater systems, electricity, or natural gas supply, no mitigation measures would be necessary for these services or utilities. To minimize effects on public services from Project construction, the Applicant would provide all police, fire, and emergency personnel with emergency response procedures for the Project. These would include detailed maps of the Project access roads, the Applicant's contact information, procedures for rescue operations, and locations of rescue baskets. The Applicant would discourage trespass and vandalism by installing permanent fencing and locked gates around the Project area. During Project operation, effects on local services and utilities would not be substantial. Response planning would be implemented to raise the level of preparedness in the event of an emergency, as follows:

- The Applicant would arrange with Klickitat Valley Hospital for helicopter transportation service if operations personnel are seriously injured and require evacuation from a remote location within the Project area.
- The Applicant would coordinate with the local fire district throughout the operational life of the Project. To minimize demand for police services during construction and operation, the Applicant would discourage trespassing and vandalism by installing chain-link fencing topped with barbed wire, padlocked gates around the Project, and pad-mounted transformers. Potential effects on fire services during Project construction and operation would be mitigated using the following measures:
 - The Applicant would provide detailed maps to fire districts showing all access roads to the Project.
 - The Applicant would provide fire districts with keys to a master lock system that would enable emergency personnel to unlock gates that would otherwise limit access to the Project.
 - The Applicant would use spark arrestors on all power equipment (such as cutting torches and tools), when necessary due to extreme fire danger conditions.
 - The Applicant would inform workers at the Project of emergency contact phone numbers and would provide training in emergency-response procedures.
 - The Applicant would mandate that fire extinguishers be carried in all maintenance vehicles.

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- The Applicant would coordinate with the local fire district to ensure that adequate water supply is available for fighting fires. The Applicant may also supply water for firefighting via an on-site well. See Section 3.4, Wetlands and Water Resources, for more detail.
 - The Applicant would minimize vehicle contact with dry vegetation through the use of non-gasoline-powered and/or high-clearance vehicles.
 - The Applicant would clear vegetation from construction areas before construction starts.
 - The Applicant would provide workers with information about local accommodations and advise workers not to use illegally established RV parks.

4.0 Cumulative Impacts

4.1 Introduction

SEPA requires project applicants to consider how the Project would contribute to cumulative impacts from other development in the region over time. The analysis presented in this chapter describes the potential incremental addition of impacts from the Project on the combined impact of energy development in Klickitat County.

In general, when combining the potential effects of the Project with the effects of past, present, and reasonably foreseeable future actions, the Project is not expected to significantly contribute to cumulative impacts. The identified incremental impacts would have a low degree of effect in a localized area that is well-suited to renewable energy development. Additionally, the Project's potential effects to resources would be limited by mitigation and avoidance efforts, thereby reducing or eliminating the incremental impacts. Mitigation and avoidance measures are described in Chapter 3, and the Project's potential contribution to cumulative impacts for each resource is summarized in the resource-specific sections below.

4.2 Past Actions

Wind energy has been evaluated in the region since the early 1990s. The first major wind project to be developed in the region was introduced in 2005, when PPM Energy (now Avangrid Renewables) announced construction of the Big Horn Wind Project near Bickleton, Washington. Numerous wind energy projects are now operating in Klickitat County. Solar energy development has trailed wind facilities; however, with technological advancements and lower costs, solar energy has begun to grow in eastern Washington (Renewable Energy Northwest 2018; National Renewable Energy Laboratory 2017).

Previous studies have considered the cumulative impacts of energy development in Klickitat County. Potential county-wide cumulative impacts of wind and smaller-scale⁶ solar energy development, as well as biomass and gas-fired plants, were analyzed in the EIS prepared for the development of Klickitat County's EOZ (Klickitat County 2004). Cumulative impacts on birds and bats resulting from wind projects in the Columbia Plateau ecoregion of Washington and Oregon have been evaluated by Johnson and Erickson (2011) on behalf of the county's planning department. Information from these studies were considered in developing the cumulative impact analysis presented here, which addresses how development of the Project could contribute to cumulative impacts from the past, present, and reasonably foreseeable future energy developments within Klickitat County (Table 4-1). The location of each project is shown on Figure 4-1.

⁶ At the time of the 2004 Klickitat County EIS, commercial-scale solar energy facilities like the Project were not yet feasible and the analysis considered solar sites on the order of less than 10 acres. However, over the past decade, advancements in technology and reductions in costs have changed what is technically and financially possible for energy development (National Renewable Energy Laboratory 2017).

There are no existing solar energy facilities in Klickitat County (Figure 4-1). Biomass and gas-fired energy plants were ultimately not included in the county EOZ as a permitted use (Klickitat County 2015); however, such projects can still be approved as a conditional use, and two gas-fired facilities are currently operating (Table 4-1). Sections 4-3 through 4-14 discuss cumulative impacts likely to be associated with existing and planned energy projects. Each section briefly examines the incremental contribution of the Project to the larger cumulative impact on the resource.

Table 4-1. Constructed and Proposed Energy Projects in Klickitat County

Name	Type	Capacity	Status
Big Horn	Wind	200 MW	Operating
Big Horn 2	Wind	50 MW	Operating
Goodnoe Hills	Wind	94 MW	Operating
Harvest Wind Farm	Wind	99 MW	Operating
Juniper Canyon I	Wind	150 MW	Operating
Linden	Wind	50 MW	Operating
White Creek	Wind	205 MW	Operating
Windy Flats (consists of Wind Point I, Windy Point II, and Windy Point IIa)	Wind	262 MW	Operating
Goldendale Generating Station (Natural Gas)	Gas-fired	277 MW	Operating
H.W. Hill Landfill Gas Project (Methane)	Gas-fired	26 MW	Operating
SDS Lumber Cogeneration Facility (Wood Waste)	Woody Biomass	10 MW	Operating
Goldendale Energy Storage Project	Pumped Storage	1,200 MW	Preliminary permit issued by FERC in March 2018

4.3 Noise

Potential cumulative sound impacts are evaluated for the projects identified in Section 4.2. Based on sound modeling conducted for wind projects in the Pacific Northwest, in general, sound from wind facilities located more than 2 miles from the solar facility siting area would not be perceptible in the Project area. Cumulative impacts would occur only from additive sound resulting from adjacent wind farms. Therefore, the discussion below focuses on sound from the Project added to sound from existing adjacent wind facilities (i.e., Big Horn, Juniper Canyon, and Harvest Wind).

As detailed in Section 3.1, the Project would not exceed the Washington State daytime or nighttime regulatory limits of 60 dBA and 50 dBA, respectively, (RCW 70.07.010 et seq.) at residences. It is anticipated that existing and future proposed wind energy facilities would be sited using setback distances that would limit noise impacts when assessed cumulatively with the Project; maintaining compliance with the applicable State noise requirements.

4.4 Air Quality

The Project would not contribute, directly or indirectly, to a cumulative impact on air quality within Klickitat County. Several wind power projects are currently permitted for construction in Klickitat County. Cumulative impacts on air quality could occur if two energy projects were constructed

concurrently. In such case, if construction traffic from both projects use the same roads, construction-related impacts from the Project could have a temporary cumulative air quality impact on the area during the construction period. Vehicle exhaust and fugitive dust emissions from Project construction would be temporary and would not be noticeable in off-site areas. The Project's temporary exhaust and fugitive dust emissions would not create a significant cumulative impact. No long-term adverse cumulative impact on air quality from solar energy development is expected because this type of development is virtually emission-free.

4.5 Vegetation and Wildlife

Historically, vegetation and wildlife habitat within Klickitat County consisted predominantly of open, arid grassland and shrub-steppe communities. However, beginning in the mid-19th century, livestock grazing and farming began to convert native plant communities to agriculture or pasture/range land (Pacific Wind Development, LLC 2011). Past and current agricultural and livestock grazing and associated development activities, as well as urban development and associated infrastructure, have contributed to the overall permanent loss and long-term degradation of native vegetation and wildlife habitat, and have contributed to the spread of nonnative, invasive plant species within Klickitat County. Native habitats have provided important breeding, foraging, and cover habitat for a variety of wildlife. Loss of native wildlife habitat results in a corresponding reduction in abundance of native wildlife, with a corresponding increase in species associated with disturbance, such as the European starling.

Effects to vegetation and wildlife habitat from future development projects would be minimized if standard BMPs for minimizing vegetation removal and controlling introduction and spread of invasive plant species are implemented during construction and operation of these projects.

Construction of the Project would permanently remove up to 1,871 acres of habitat (Table 3.3-4). Mitigation measures to minimize effects to vegetation from the Project, including BMPs to minimize vegetation removal, reseeding of disturbed areas, and controls on the introduction and spread of weeds, are described in Section 3.3.5. The disturbed area represents 0.3 percent of the acreage within the EOZ. When viewed in conjunction with past, present, and reasonably foreseeable future energy projects in Klickitat County, the contribution of the Project to cumulative effects to vegetation and wildlife is not expected to be significant.

4.6 Wetlands and Water Resources

The Project would not contribute, directly or indirectly, to a cumulative impact on wetlands, streams, or water resources within Klickitat County. During construction, intermittent or ephemeral streams would not be altered, and therefore, drainage patterns would be largely unchanged from present conditions. Water use during construction and operations would be within the quantities permitted and used under existing water rights. Project construction and operation would follow BMPs to avoid or minimize erosion-related and sedimentation-related impacts on surface water quality. Consequently, the Project would not change the existing pattern and capacity of drainage flow within Klickitat County nor would it contribute to a cumulative impact on water

quality. For this reason, the Project would not contribute to any cumulative impact on surface water, groundwater, or wetlands in Klickitat County.

4.7 Geologic and Flood Hazards

The Project would not contribute, directly or indirectly, to a long-term cumulative impact on geologic or flood hazards in Klickitat County. As described in Section 3.5, Geologic and Flood Hazards, the risks from geologic hazards, flooding, and unstable soils associated with the Project are low. BMPs would be implemented to minimize the potential for soil erosion. The solar facility siting area is not within an area susceptible to flooding, and construction and operation of the Project would not increase the potential for flooding. The Project would be designed in accordance with relevant codes to be resistant to earthquake damage. Because of the low potential for the Project to affect, or be affected by, geologic and flood hazards, it is not likely to contribute to cumulative impacts for these resources.

4.8 Cultural Resources

The Project is unlikely to contribute to cumulative adverse impacts on cultural resources because it has been designed to avoid significant cultural sites. BMPs would be implemented to address inadvertent discoveries in the event that an unknown cultural site is discovered during construction, and to avoid or minimize impacts from such a discovery. The Project would incrementally contribute to a cumulative potential for effects on unknown cultural resources because the low risk of inadvertent impacts from the Project would combine with the low risks from the other projects being constructed in the region.

4.9 Visual and Aesthetic Resources

Past and present activity in Klickitat County has substantially changed the landscape by altering natural landforms and vegetation, as well as introducing human-made features. Agricultural activities have resulted in extensive changes to land cover throughout the region. The most noticeable change to the visual setting has been the development of numerous, large-scale wind energy facilities during the past two decades. The wind turbines and their associated transmission lines are collectively the dominant feature in the existing visual setting, and have introduced strong recurring vertical elements within the landscape.

The Project would add to the visible presence of energy-related development in Klickitat County, but it would be consistent with the intent of the EOZ and the Klickitat County Comprehensive Plan. The Project would be most visible within the foreground and middleground distance zones (i.e., zero up to 5 miles from a viewer). The perceived contrast created by the Project would generally diminish as distance between the viewer and the Project facilities increases. At a distance of 5 miles and further (background distance zone), the shape and mass of the solar arrays may be visible; however, their prominence would be reduced, and they would appear as a subordinate feature in the landscape setting. Furthermore, because solar facilities have a relatively low profile, they are generally less prominent features across the landscape than are wind turbines, which tend to

dominate views where present. Nevertheless, the Project would add a new and distinctive visual element to the existing landscape, and thereby contribute to cumulative aesthetic impacts from other sources of landscape change. Because the Project facilities would be a subordinate feature within the landscape and they would be visible primarily within the localized area around the Project, the Project would represent a minor incremental addition to the degree of landscape modification from past and present human actions.

4.10 Public Safety and Environmental Health

The primary public safety and environmental health risk from Project construction and operation is the potential for fire. The risk of fire would be minimized through the use of BMPs described in Section 3.8, Public Safety and Environmental Health, but could contribute to an incremental increase in cumulative fire risk in the area. As discussed in Section 3.8, BMPs would be followed during Project construction and operation to avoid and minimize risks to the public's health and safety, including measures to prevent and manage fire risk. By mitigating risks associated directly with the Project, the potential for the Project to contribute to a cumulative effect on public health and safety would be low.

4.11 Roads and Transportation

The primary impact to roads and transportation from Project construction and operation would be from traffic during the 9- to 12-month construction period. Impacts to local roads would be mitigated through measures to be defined in the Road Haul Agreement to be developed. Traffic impacts during construction could contribute to a cumulative impact on traffic if construction of the Project occurred at the same time as construction of another project in the vicinity. Currently, no other projects are permitted or proposed for construction within 10 miles of the Project. As discussed in Section 3.10, BMPs would be followed during Project construction and operation to avoid and minimize traffic impacts. By mitigating risks associated directly with the Project, the potential for the Project to contribute to a cumulative effect on roads and transportation would be low.

4.12 Recreation, Housing, and Public Services

Because the Project would not be visible in the Columbia River corridor where most of the recreational activities occur, the Project would not contribute to cumulative visual impacts to recreation along the river. With shorter infrastructure heights, solar facilities are generally less prominent features across the landscape than wind turbines (see Section 3.7, Aesthetics, Light, and Glare). Furthermore, the Project is located in a rural area that does not include popular regional recreation destinations. For these reasons, the Project's contribution to any cumulative impact to recreation is expected to be minimal.

As discussed in Section 3.10, Recreation, Housing, and Public Services, the Project would not have an adverse impact on housing availability because there is sufficient housing for the Project's construction and operations personnel. However, if one of the other reasonably foreseeable future

projects listed in Table 4-1 were constructed at the same time as the Project, cumulative housing demand could put temporary pressure on the housing market. However, as described in Section 3.10, the current vacancy rate in Klickitat County alone suggests that approximately 2,000 units are currently vacant. Construction-related demand would be temporary and could be accommodated by existing housing vacancies. Therefore, no significant adverse cumulative effects to housing are anticipated.

4.13 Land Use

Klickitat County has local land-use regulations in place to prevent incompatible uses and the degradation of agricultural lands. The implementation of these regulations minimizes the potential for cumulative land-use impacts.

Development of wind and solar projects in Klickitat County is resulting in long-term conversion of open space, agricultural, and rangeland uses to wind and solar energy production. However, existing land uses such as grazing and agriculture can continue up to the edges of project facilities. In the short term, proposed wind and solar energy facilities would not collectively disrupt or change the underlying land-use pattern of the affected counties. While some localized land-use conflicts could occur based on the location of specific turbines or solar arrays, these are site-specific and not indicative of conflict with the broader underlying rural land-use pattern.

Only a small percentage of total land area is taken out of use by the turbines, solar arrays, access roads, and other associated infrastructure for renewable energy projects. In Klickitat County, the wind and solar EOZ covers approximately 680,000 acres, overlaying more than half of the county's total land area. Within that context, the Project area's 1,871 acres represents approximately 0.3 percent of the EOZ and would be a negligible portion of the total county area.

Wind and solar energy leases pay the landowner for use of the land. These revenues are valuable in rural areas of Washington and Oregon, where farm incomes have been in decline (Klickitat County 2004; Renewable Northwest 2018). Thus, renewable energy projects can have a positive cumulative impact by providing a stable continuing source of income to farmers, thereby helping farmers to continue their operations and adding to the local tax base. Furthermore, the WDNR has estimated that compared to the grazing lease rates, solar lease values could substantially increase contributions to the common school trust system (KUOW 2018). Therefore, the Project would have a positive contribution to this beneficial cumulative impact.

4.14 Utilities

As described in Section 3.12, Public Services and Utilities, the Project is not anticipated to have a significant long-term impact on county public services and utilities. However, the temporary construction work force for the Project would be relatively large, and if other projects are constructed at the same time, the Project could contribute to a temporary incremental increase in cumulative effects on the demand for fire suppression, police protection, and medical services. Once operational, the Project, collectively with other energy projects in the region, would contribute to a small incremental cumulative impact on fire, police, medical, educational, and other public services

because the number of Project personal in the area would drop during operation. The demand increase would be planned, incremental, and moderate, and would be mitigated by increased tax revenues resulting from local income growth from renewable energy lease revenues.

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Figures

Lund Hill Solar Energy Project

Figure 2-1 Project Vicinity and Site Layout

KLICKITAT COUNTY, WASHINGTON

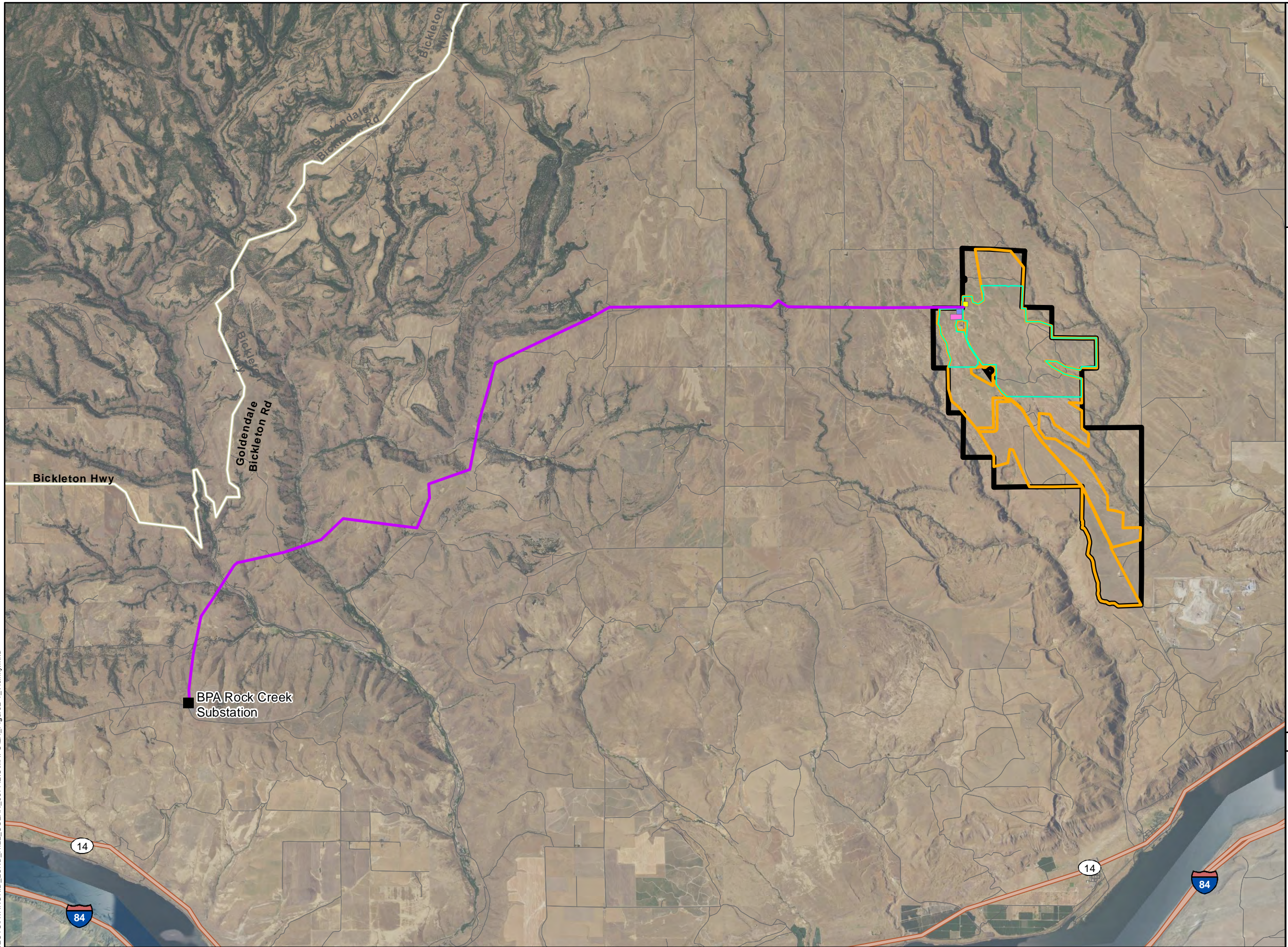
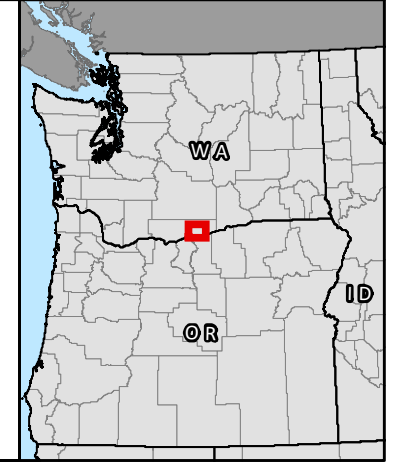
-  Lease Boundary
-  Solar Facility Siting Area
-  Project Area
-  Existing Juniper Canyon Transmission Line
-  Proposed O&M Facility
-  Proposed Staging/Laydown Area
-  Proposed Substation
-  Highway
-  Major Road
-  Local Road



Data Sources

Reference Map

Avangrid-Project Boundary, Components;
USDA-NAIP Imagery



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1:100,000 NAD 1983 StatePlane Washington South FIPS 4602 Feet

0 0.5 1 2 Miles

Lund Hill Solar Energy Project

Figure 2-2 Project Layout

KLICKITAT COUNTY, WASHINGTON

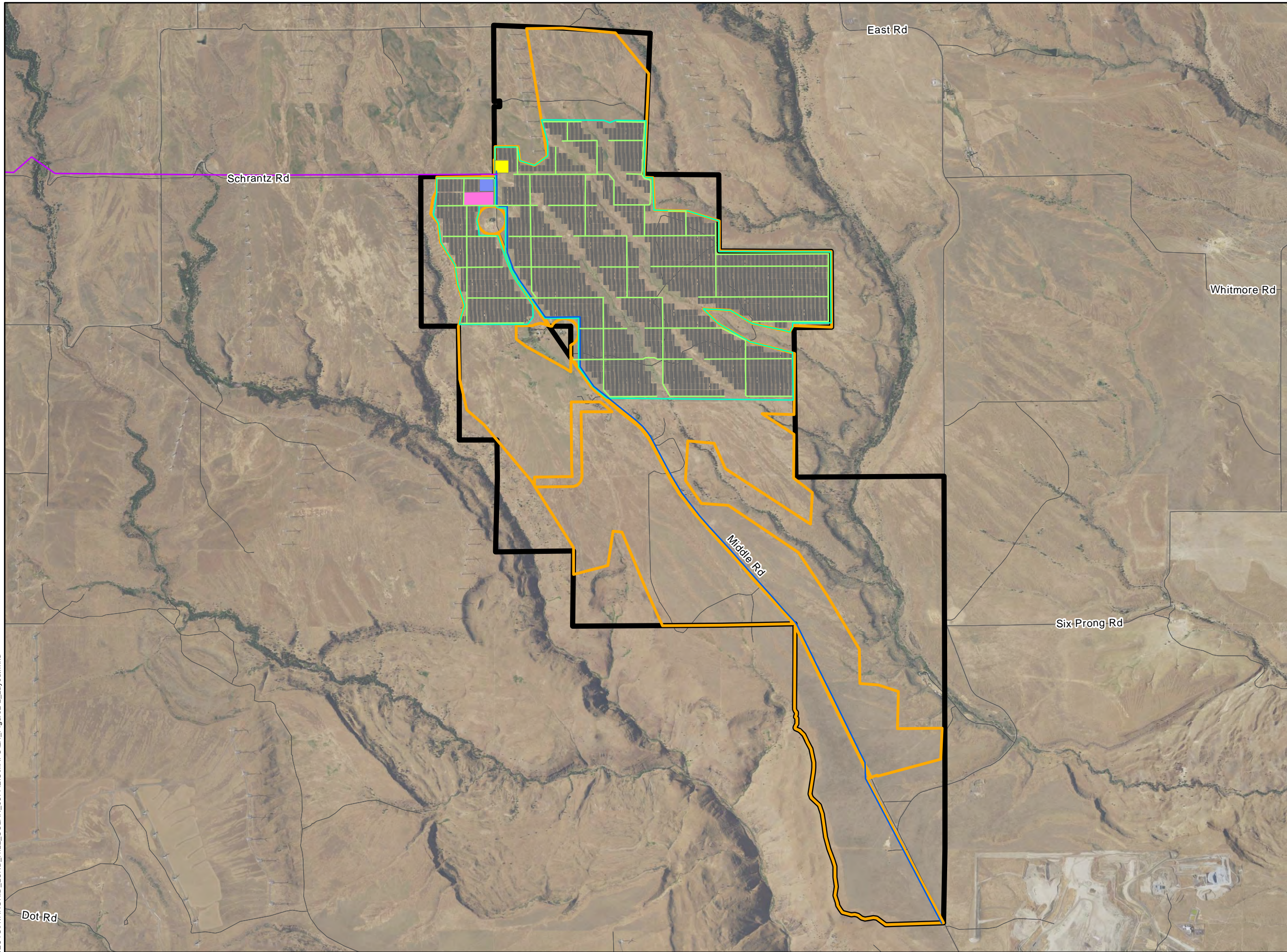
-  Lease Boundary
-  Solar Facility Siting Area
-  Project Area
-  Existing Juniper Canyon Transmission Line
-  Proposed Access Roads
-  Potential Overhead Transmission Line
-  Proposed O&M Facility
-  Proposed Solar Array
-  Proposed Staging/Laydown Area
-  Proposed Substation



Data Sources

Reference Map

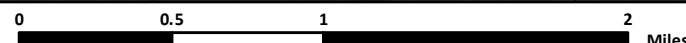
Avangrid-Project Boundary, Components;
USDA-NAIP Imagery



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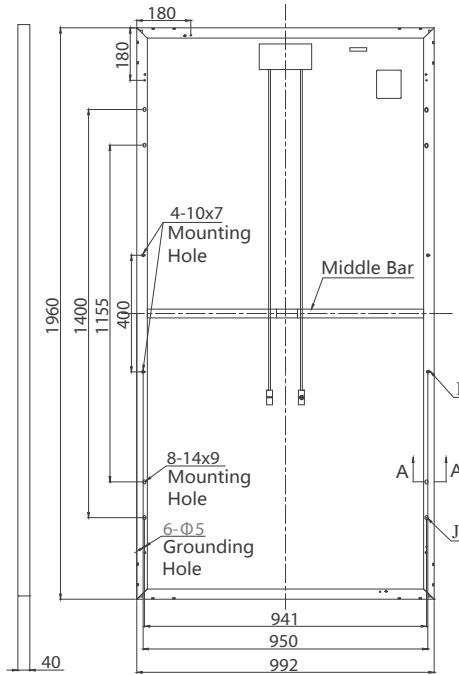


1:40,000 NAD 1983 StatePlane Washington South FIPS 4602 Feet

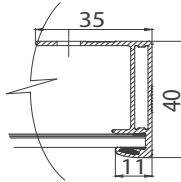


TYPICAL ENGINEERING DRAWING

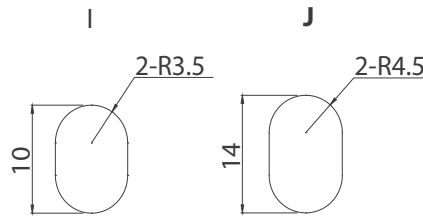
Rear View



Frame Cross Section A-A



Mounting Hole



MECHANICAL DATA

Dimensions

**1960 x992 x40 mm
(77.2 x39.1 x1.57 in)**

Cell Type	Poly-crystalline, 6 inch
Cell Arrangement	72 (6 x 12)
Weight	22.4 kg (49.4 lbs)
Front Cover	3.2 mm tempered glass
Frame Material	Anodized aluminium alloy
J-Box	IP67, 3 diodes
Cable	PV1500DC-F1 4 mm ² (IEC) & 12 AWG 2000 V (UL), 1160 mm (45.7 in)
Connector	T4 series or UTX or MC4 series
Per Pallet	26 pieces, 635 kg (1400 lbs)
Per container (40' HQ)	624 pieces



Example of Solar Module Components

Source: Canadian Solar Inc., 545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada, www.canadiansolar.com



Lund Hill Solar Energy Project Environmental Impact Statement

**Figure 2-3
Example Solar Module**

CLICKITAT COUNTY, WASHINGTON





Source: Array Technologies Inc., 3901 Midway Place NE, Albuquerque, NM 87109 USA, www.arraytechinc.com.

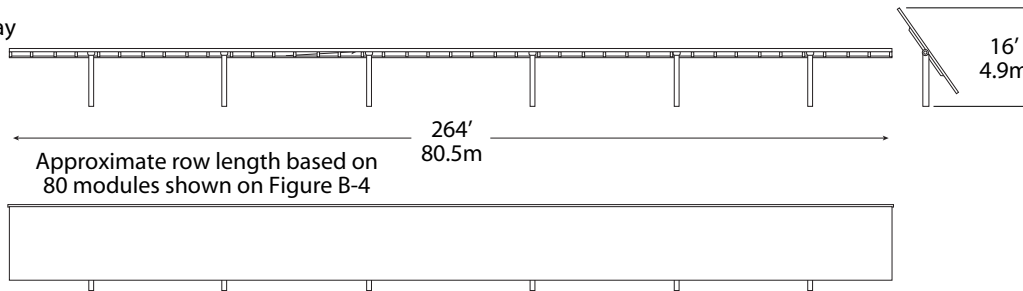
GENERAL

Annual Power Consumption (kWh per 1 MW)	400 kWh per MW per year, estimated
Land Area Required per 1 MW	Approx. 5 to 5.75 acres per MW @ 33% GCR (site and design specific)

TYPICAL STRUCTURAL AND MECHANICAL FEATURES

Tracking Type	Horizontal single axis
Tilt Angle	0°
kW per Drive Motor	~ 650–800 kW DC
String Voltage	Up to 1,500V DC
Maximum Linked Rows	28
Maximum Row Size	80 modules (crystalline, 1,000V DC) & 90 modules (crystalline, 1,500V DC)
Drive Type	Rotating gear drive
Motor Type	2 HP, 3 PH, 480V AC
Motors per 1 MW AC	Less than 2
East-West / North-South Dimensions	Site / module specific
Array Height	54" standard, adjustable (46" min height above grade)
Ground Coverage Ratio (GCR)	Flexible, 28–45% typical
Modules Supported	Most commercially available, including frameless crystalline and thin film
Tracking Range of Motion	± 52°
Operating Temperature Range	-30°F to 140°F (-34°C to 60°C)
Module Configuration	Single-in-portrait standard. Dual-in-landscape (crystalline), four-in-landscape (thin film) also available.
Module Attachment	Single fastener, high-speed mounting clamps with integrated grounding. Traditional rails for crystalline in landscape, custom racking for thin film and frameless crystalline per manufacturer specs.
Materials	HDG steel and aluminum structural members

Approximate maximum array height when modules are stacked and fully inverted



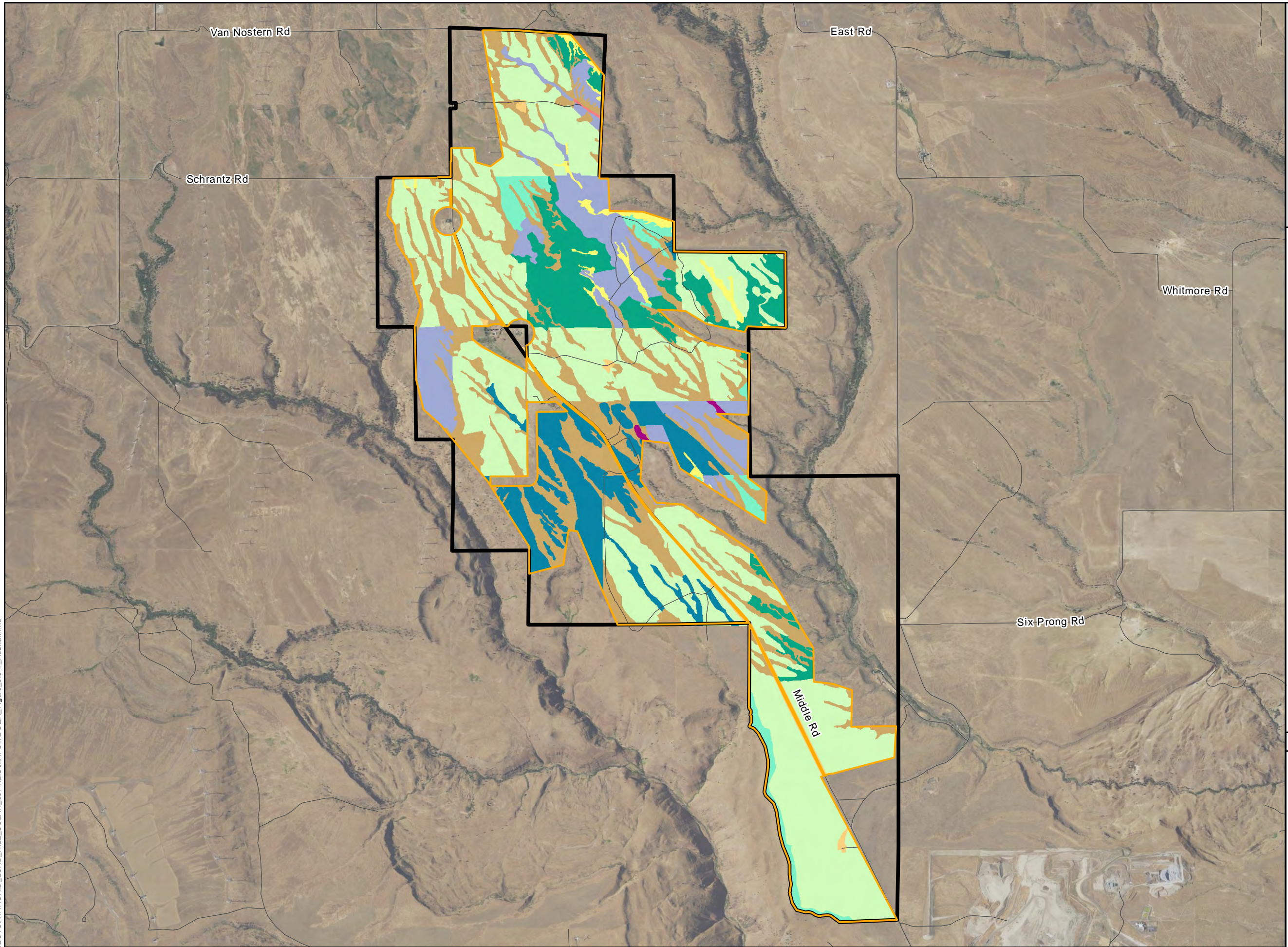
Lund Hill Solar Energy Project Environmental Impact Statement

Figure 2-4 Example Solar Tracker Components

Klickitat County, Washington



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Lund Hill Solar Energy Project

Figure 3.3-1 Habitat Types Mapped within the Solar Facility Siting Area

KLICKITAT COUNTY, WASHINGTON

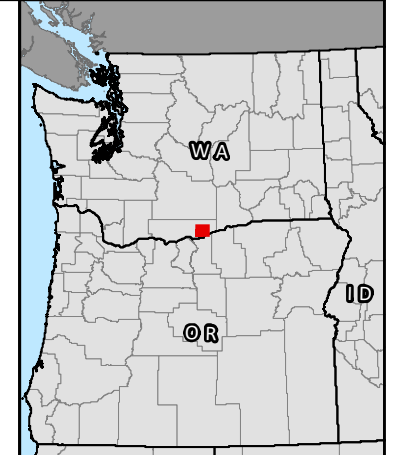
-  Lease Boundary
 -  Solar Facility Siting Area
 -  Local Road
- Habitat Type
-  CRP/Revegetated
 -  Developed/Disturbed
 -  Dwarf Shrub-steppe
 -  Dwarf Shrub-steppe - Native Perennial Grassland Matrix
 -  Escarpment/Talus
 -  Exotic Annual Grassland
 -  Juniper Woodland
 -  Native Perennial Grassland
 -  Riparian Scrub-shrub
 -  Shrub-steppe
 -  Upland Scrub-shrub



Data Sources

Avangrid-Project Boundary;
USDA-NAIP Imagery




Reference Map



Lund Hill Solar Energy Project

Figure 3.6-1
Cultural Resources Survey
Area

Klickitat County, Washington

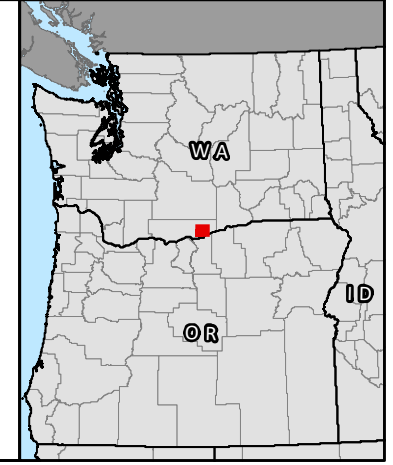
-  Lease Boundary
-  Solar Facility Siting Area
-  Area Surveyed for Cultural Resources



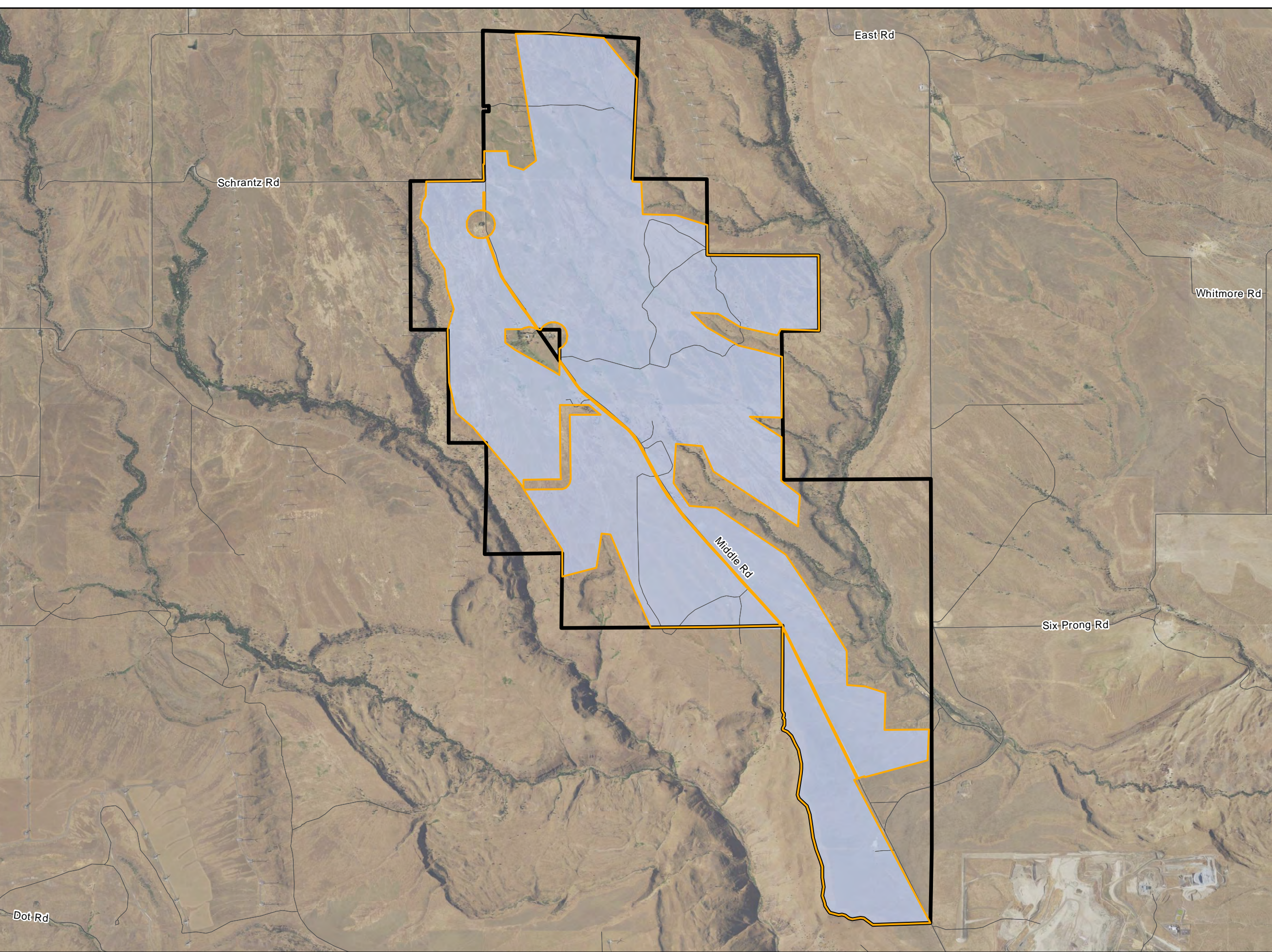
Data Sources

Reference Map

Avangrid-Project Boundaries;
PaleoWest-Survey Area;
USDA-NAIP Imagery



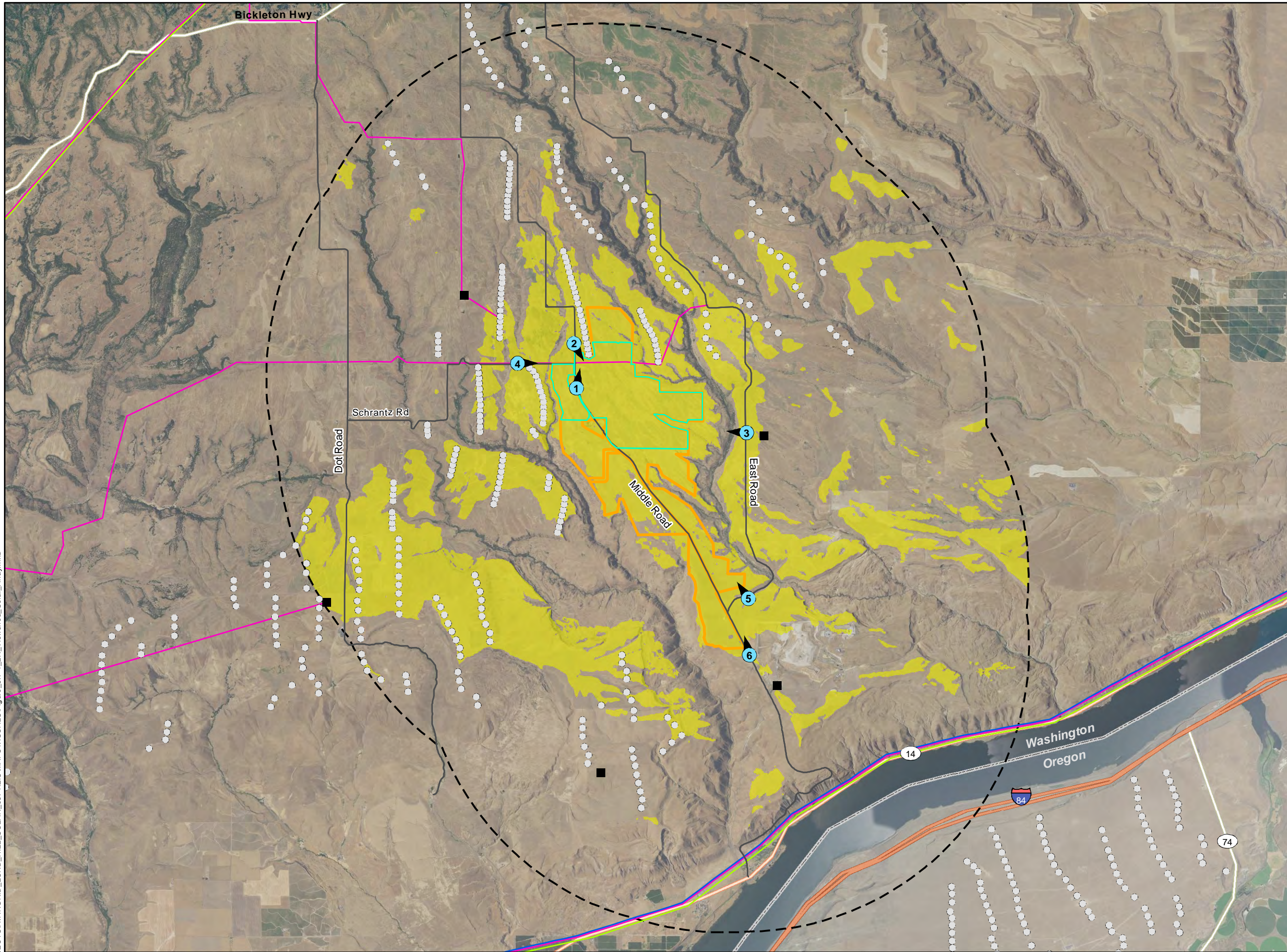
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Lund Hill Solar Energy Project

Figure 3.7-1 Solar Array Viewshed Analysis

KLICKITAT COUNTY, WASHINGTON



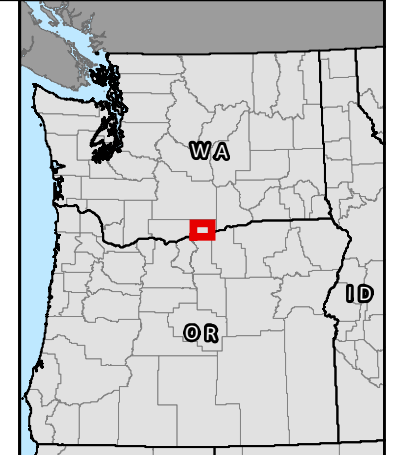
- Solar Facility Siting Area
- Solar Facility Siting Area 5-mile Radius
- Project Area
- Existing Wind Turbines
- Existing Substation
- Existing Transmission Line Voltage
 - 230 kV
 - 345 kV
 - 500 kV
- State Boundary
- Interstate
- Highway
- Major Road
- Local Road
- Solar Array Potential Visibility
 - Not Visible
 - Potentially Visible
- Photo Location and Direction



Data Sources

Avangrid-Project Boundary, USDA-NAIP Imagery 2017
 ESRI - Base Data 2016
 Ventyx - Existing Transmission, Turbines, Substations

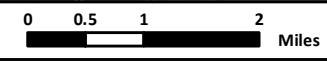
Reference Map



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Lund Hill Solar Energy Project

Figure 3.9-1 Transportation Routes

KLICKITAT COUNTY, WASHINGTON

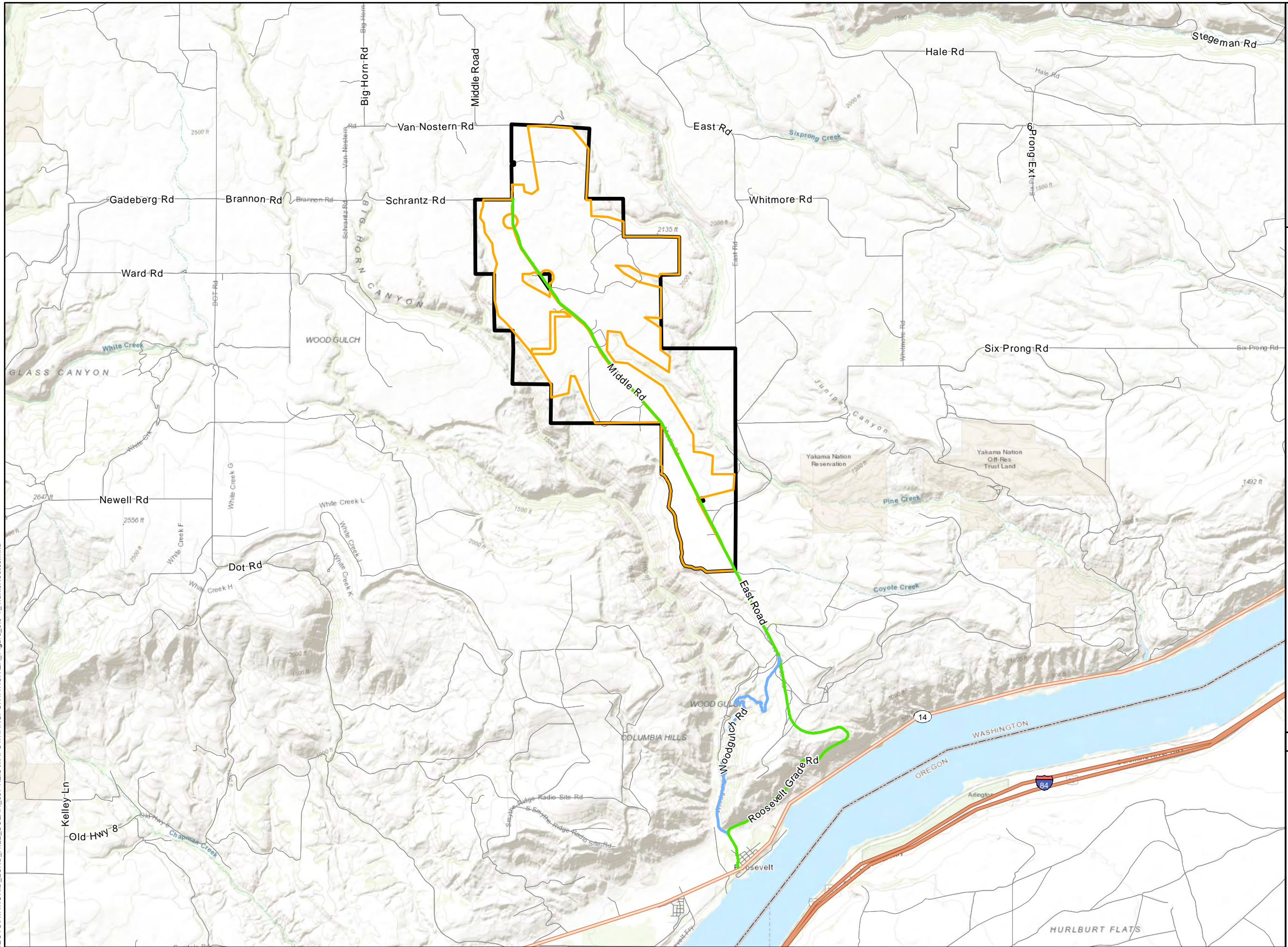
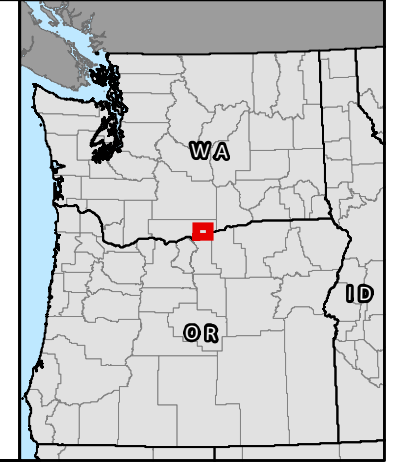
-  Lease Boundary
-  Solar Facility Siting Area
- Transportation Route
 -  Primary
 -  Alternate
-  State Boundary
-  Interstate
-  Highway
-  Local Road



Data Sources

Avangrid-Project Boundary: ESRI Basemap, Roads

Reference Map

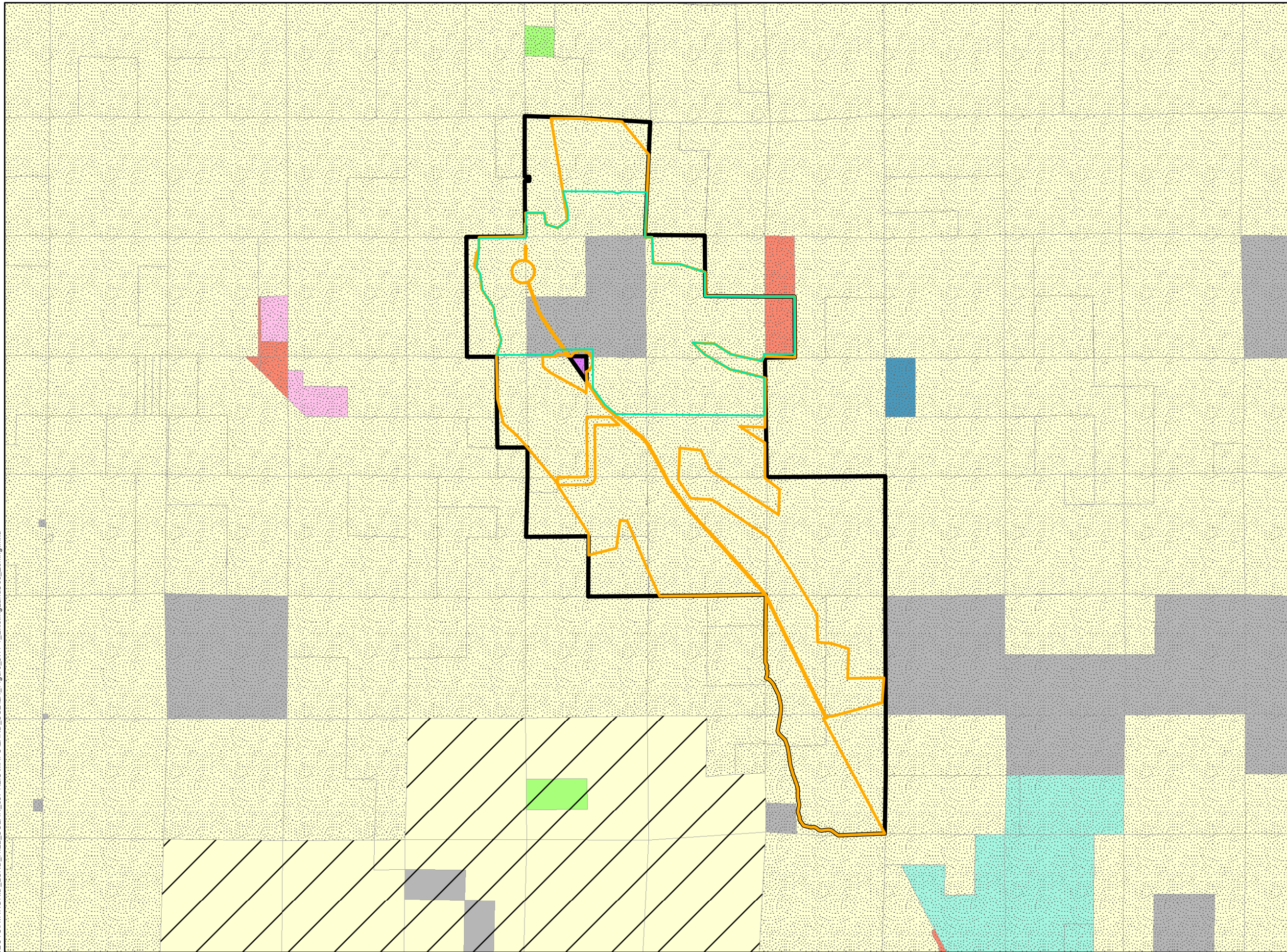
















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Lund Hill Solar Energy Project

Figure 3.11-1 Existing Land Use and Zoning

KLICKITAT COUNTY, WASHINGTON



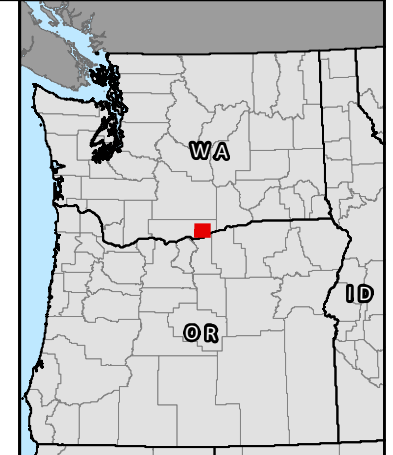
-  Lease Boundary
-  Solar Facility Siting Area
-  Project Area
- Klickitat County Land Use**
-  Current Use - Ag
-  Current Use - Open Space
-  Single Unit
-  Residential Land - Undivided
-  Other Residential
-  School
-  Service - Governmental
-  Service - Miscellaneous
-  US Govt
- Klickitat County Zoning**
-  Extensive Agriculture
-  Rural Residential 2



Data Sources

Avangrid-Project Boundary;
Klickitat County-Land Use, Zoning
USDA-NAIP Imagery

Reference Map








R:\PROJECTS\AVANGRID\LUND_HILL_SOLAR_6574\EIS\MAPS\LAND_USE\LH_Figure_3.11-1_ExistingLandUse_Zoning.mxd

Lund Hill Solar Energy Project

Figure 3.11-2 Energy Overlay Zone

KLICKITAT COUNTY, WASHINGTON

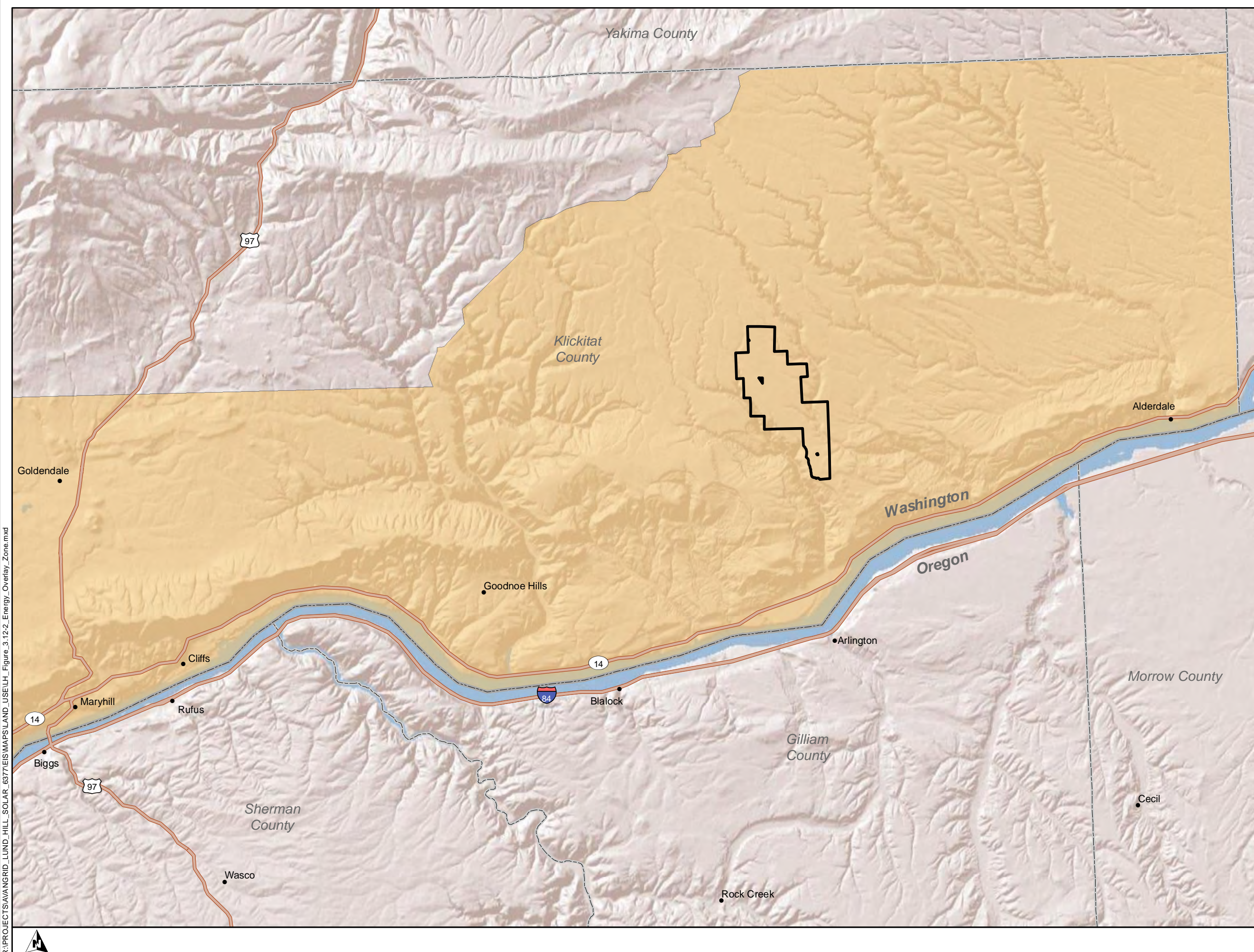
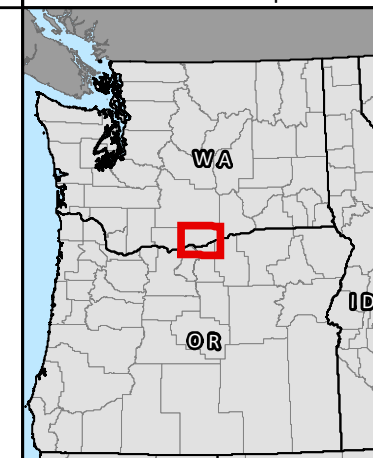
-  Lease Boundary
-  Energy Overlay Zone
-  State Boundary
-  County Boundary
-  Highway



Data Sources

Reference Map

Avangrid-Project Boundary; ESRI - Basemap
Klickitat County-EOZ












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Lund Hill Solar Energy Project

Figure 3.12-1 Natural Gas Pipelines and Electrical Transmission Lines

KLICKITAT COUNTY, WASHINGTON

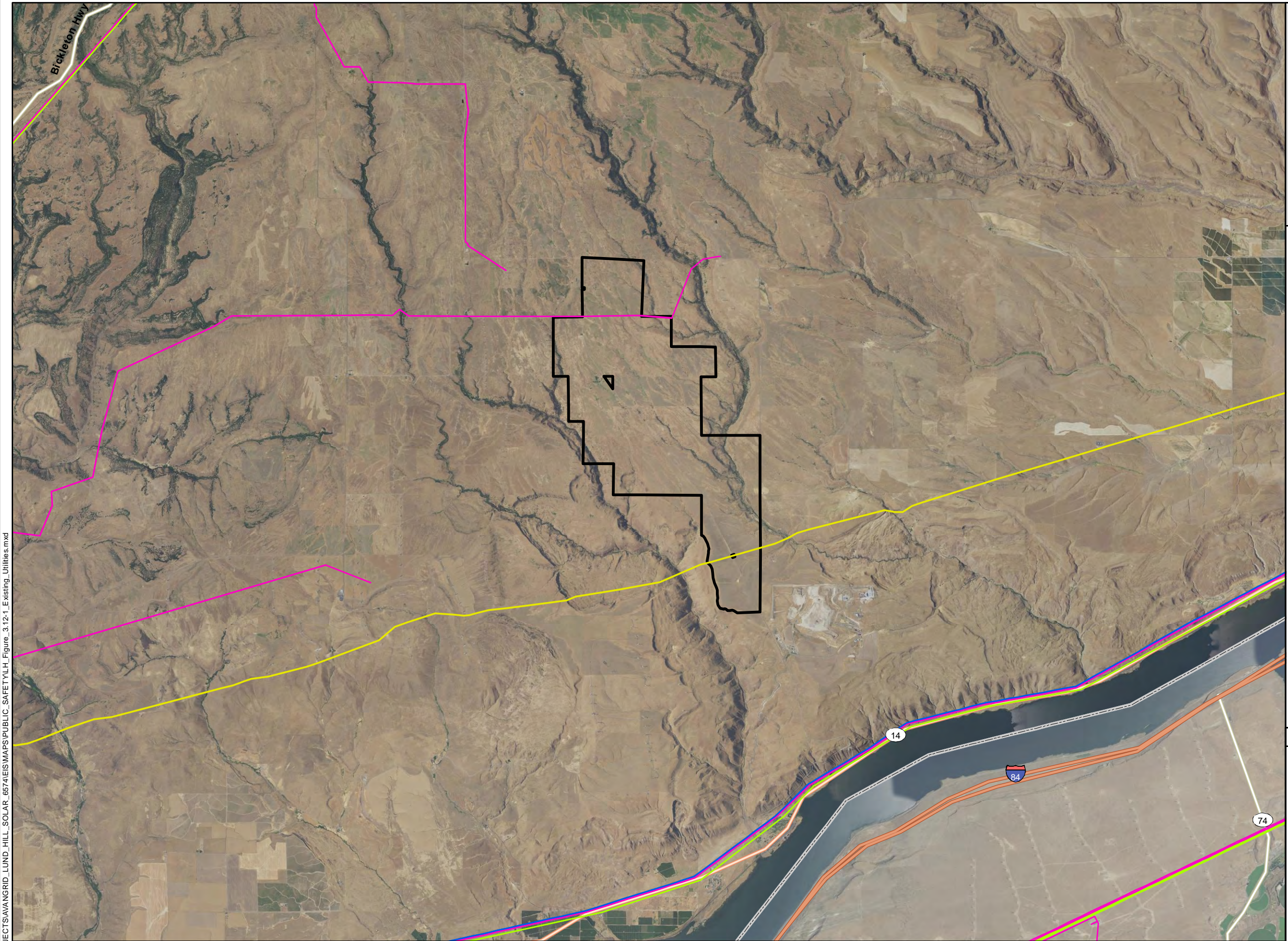
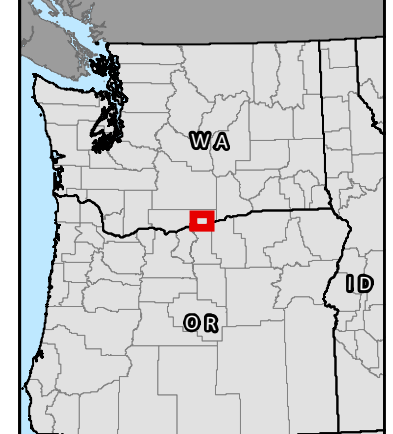
-  Lease Boundary
-  State Boundary
-  Existing Natural Gas Pipeline
- Existing Transmission Line Voltage
 -  230 kV
 -  345 kV
 -  500 kV
-  Interstate
-  Highway
-  Major Road



Data Sources

Avangrid-Project Boundary, USDA-NAIP Imagery
Ventrix Utilities

Reference Map



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




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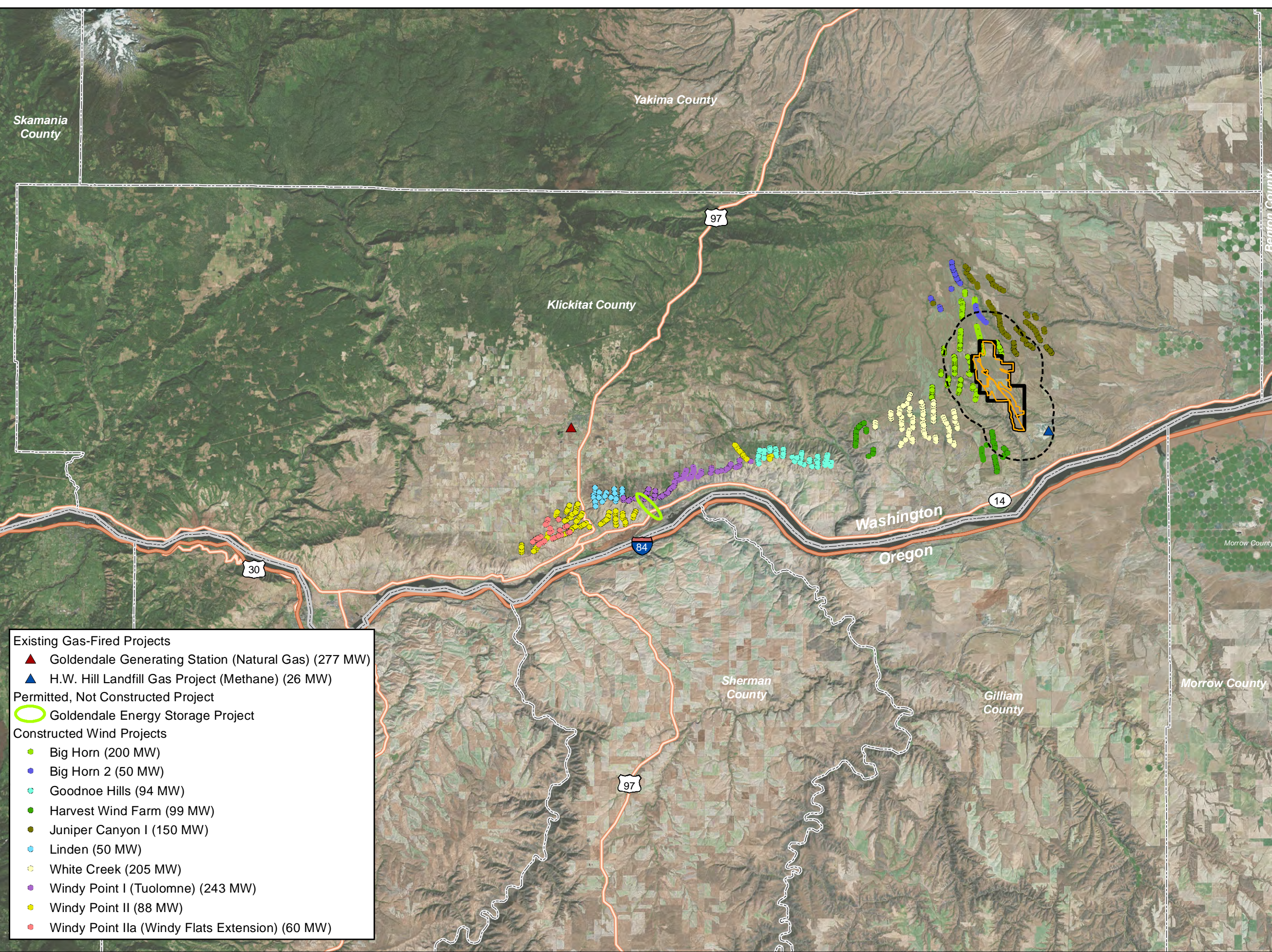
0 1 2 4 Miles














Lund Hill Solar Energy Project

**Figure 4-1
Nearby Constructed and Proposed Energy Projects**

KLICKITAT COUNTY, WASHINGTON

-  Lease Boundary
-  Solar Facility Siting Area
-  Solar Facility Siting Area 2-mile Buffer
-  State Boundary
-  County Boundary
-  Interstate
-  Highway

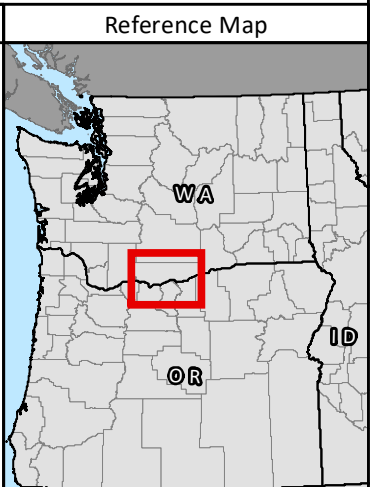


- Existing Gas-Fired Projects**
-  Goldendale Generating Station (Natural Gas) (277 MW)
 -  H.W. Hill Landfill Gas Project (Methane) (26 MW)
- Permitted, Not Constructed Project**
-  Goldendale Energy Storage Project
- Constructed Wind Projects**
-  Big Horn (200 MW)
 -  Big Horn 2 (50 MW)
 -  Goodnoe Hills (94 MW)
 -  Harvest Wind Farm (99 MW)
 -  Juniper Canyon I (150 MW)
 -  Linden (50 MW)
 -  White Creek (205 MW)
 -  Windy Point I (Tuolomne) (243 MW)
 -  Windy Point II (88 MW)
 -  Windy Point IIa (Windy Flats Extension) (60 MW)



Data Sources

Avangrid-Project Boundary, USDA-NAIP Imagery 2017
 Hoen et al. 2018; Klickitat County 2011; ODOE 2018;
 Renewable Energy Northwest 2018



















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Appendix A
Delineated Wetlands and Waters Mapbook

Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 1 of 15

KLICKITAT COUNTY, WASHINGTON

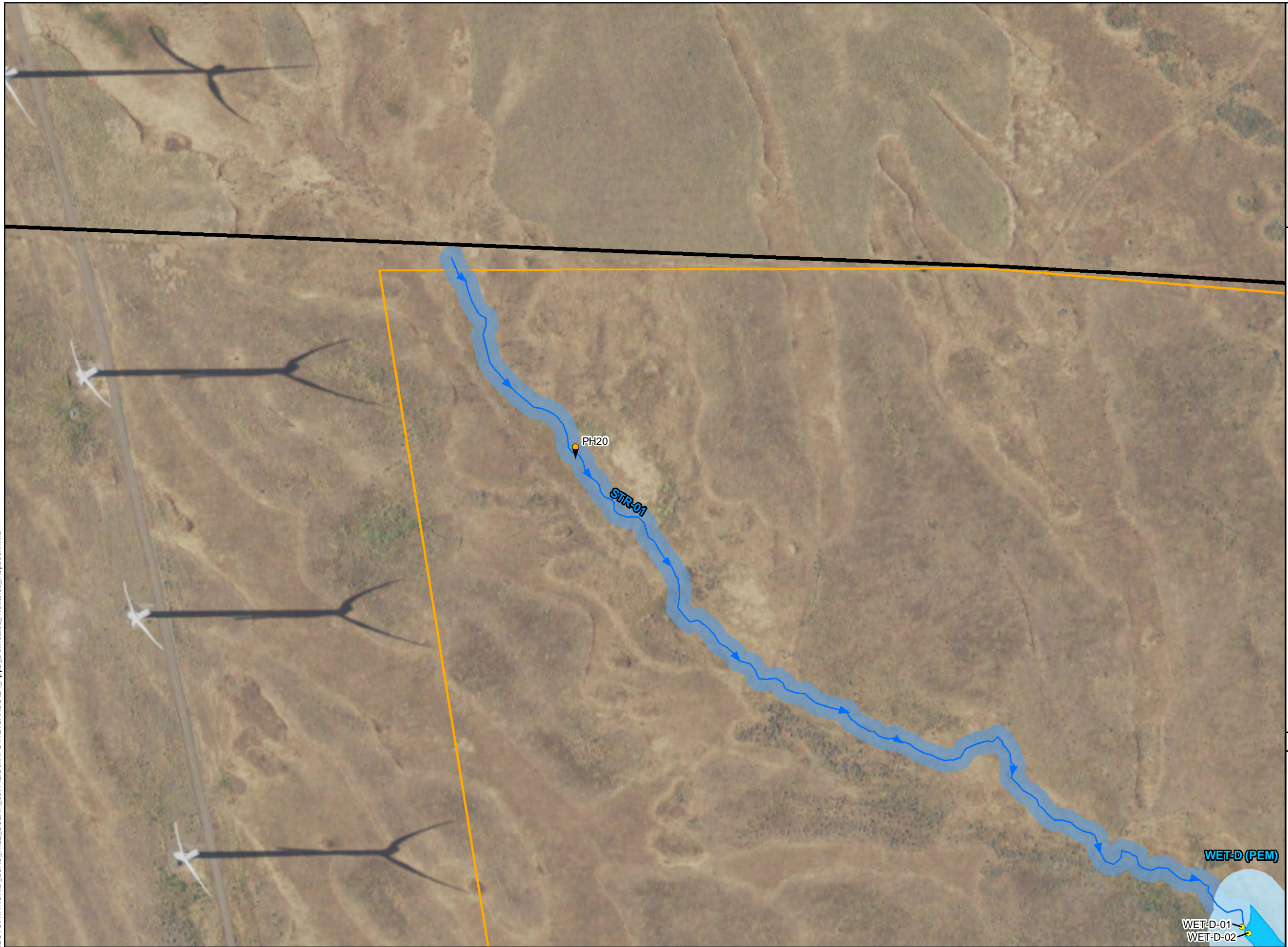
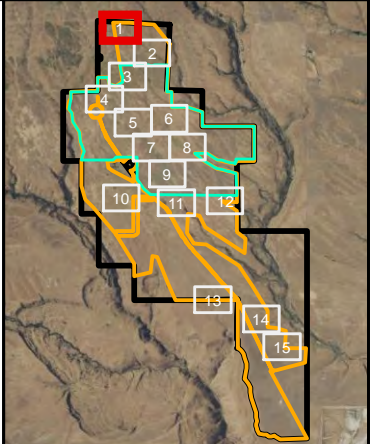
-  Lease Boundary
-  Solar Facility Siting Area
-  Analyzed Project Area
-  Existing Juniper Canyon Transmission Line
-  Proposed Access Roads
-  Potential Extent of Overhead Transmission Corridor
-  Proposed O&M Facility
-  Proposed Staging/Laydown Area
-  Proposed Substation
-  Proposed Solar Array
-  Sample Plot
-  Photo Location and Direction
-  Delineated Stream
-  Stream Buffer
-  Delineated Wetland
-  Wetland Buffer



Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map





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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 2 of 15

KLICKITAT COUNTY, WASHINGTON

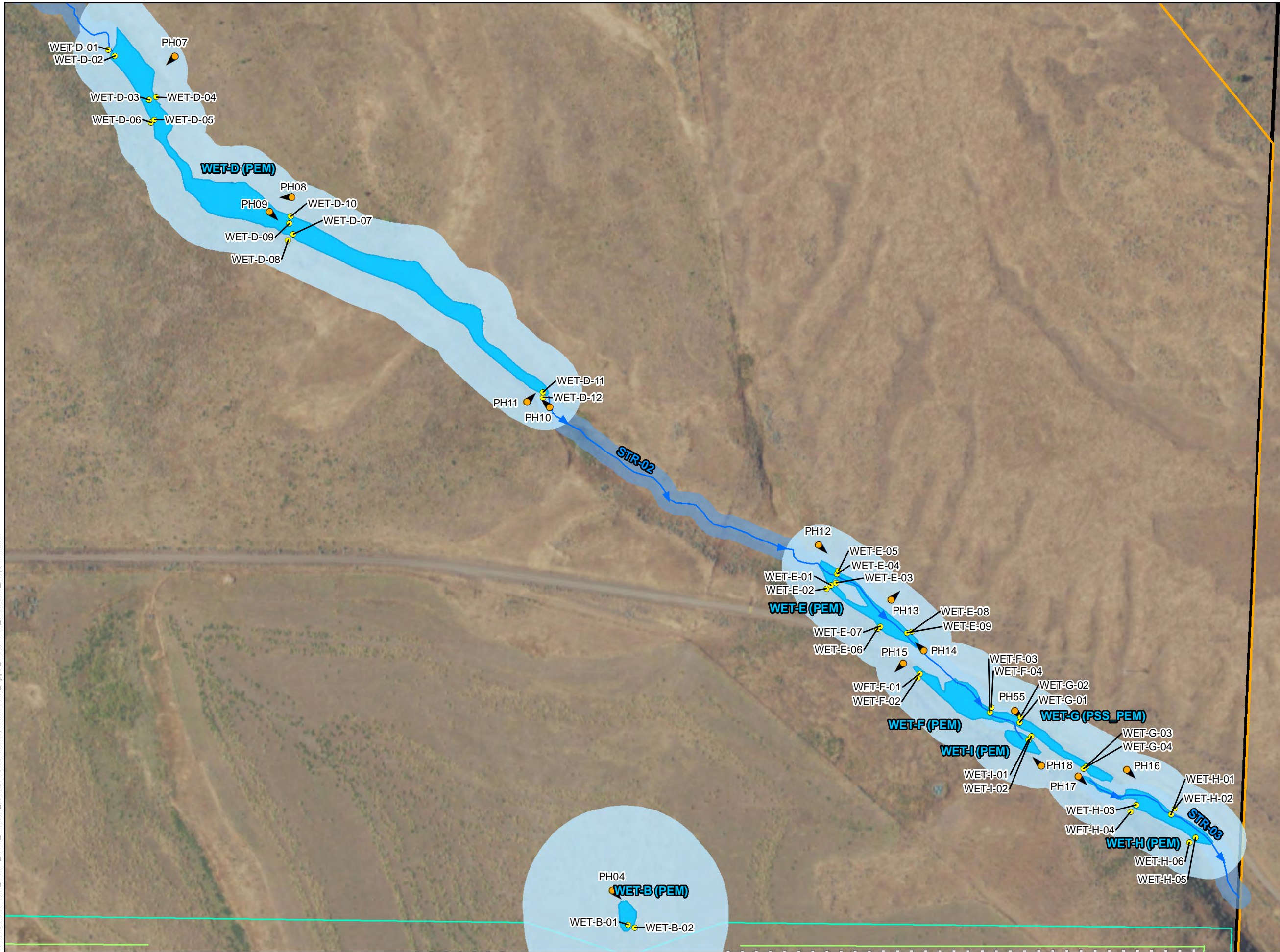
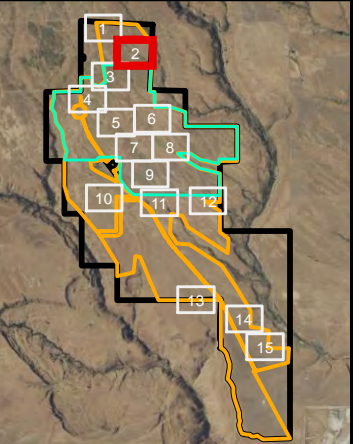
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map

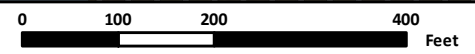


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






NAD 1983 StatePlane Washington South FIPS 4602 Feet



Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 3 of 15

KLICKITAT COUNTY, WASHINGTON

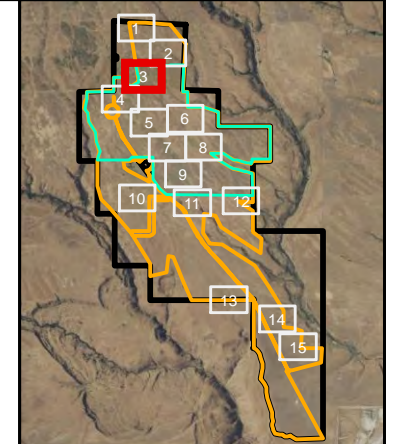
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map

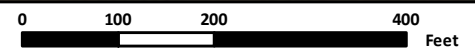


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NAD 1983 StatePlane Washington South FIPS 4602 Feet



















Lund Hill Solar Project

Delimited Wetlands and Waters

Sheet 4 of 15

KLICKITAT COUNTY, WASHINGTON

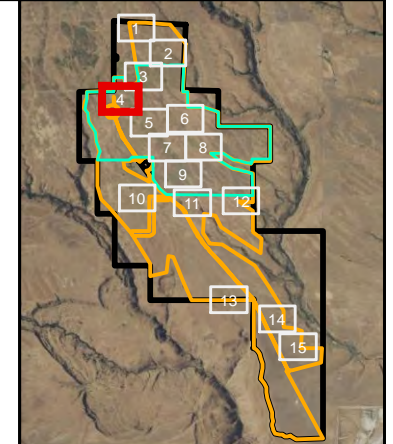
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-  Delineated Wetland
-  Wetland Buffer



Data Sources

Avangrid-Project Components;
 USDA-NAIP Imagery 2017;
 Tetra Tech-Delineated Wetlands, Streams,
 Sample Plots, Photo Points

Reference Map



















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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 5 of 15

KLICKITAT COUNTY, WASHINGTON

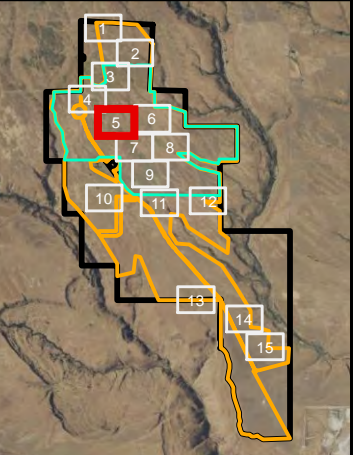
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-  Wetland Buffer



Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map










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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 6 of 15

KLICKITAT COUNTY, WASHINGTON

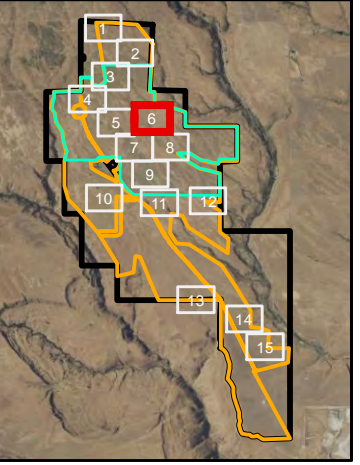
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-  Wetland Buffer



Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map



PH02
PH03
WET-A (PEM)
WET-A-SP2
WET-A-SP1

















PH44
WET-X (PEM)
WET-X2
WET-X1

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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 7 of 15

KLICKITAT COUNTY, WASHINGTON

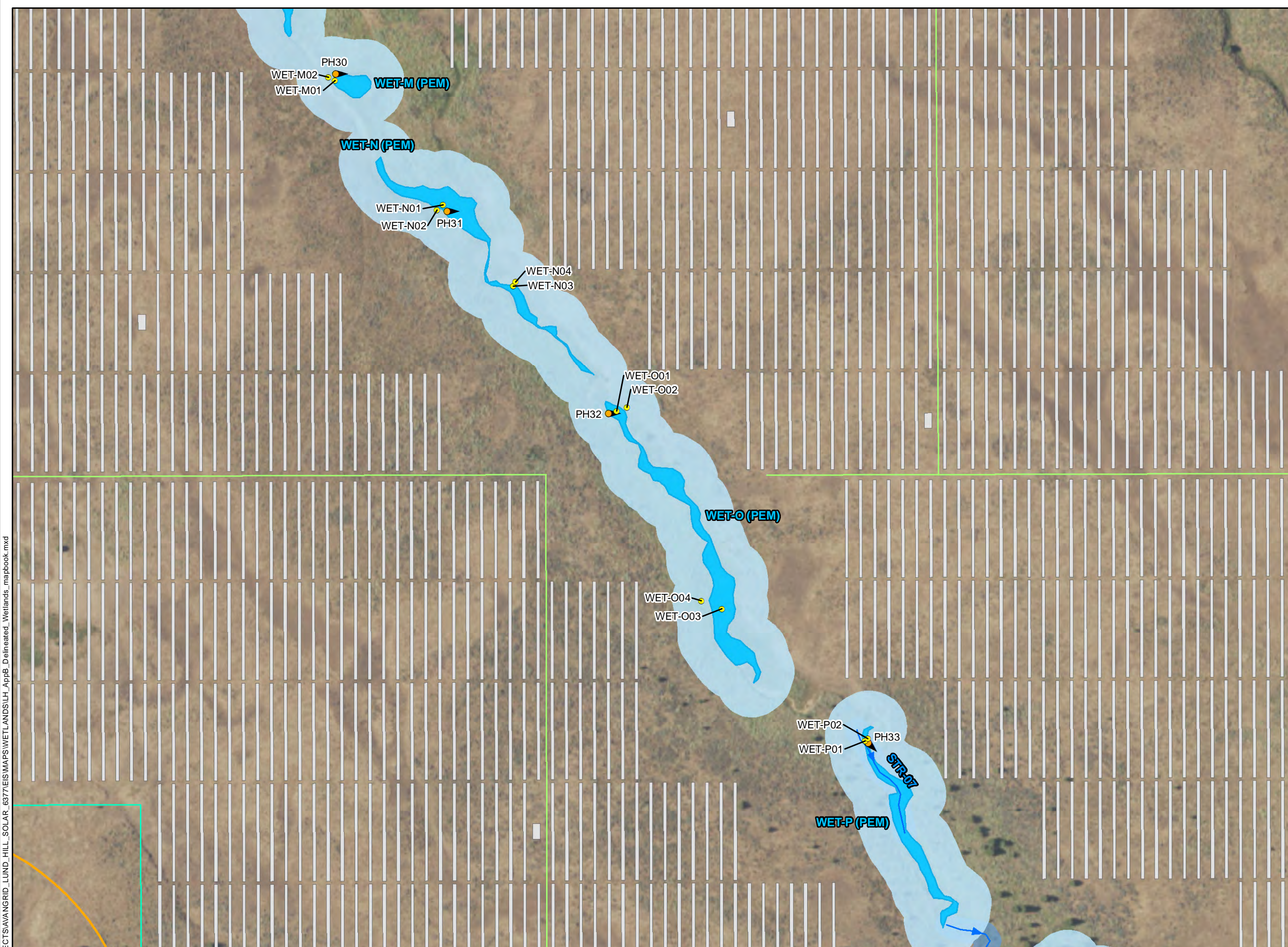
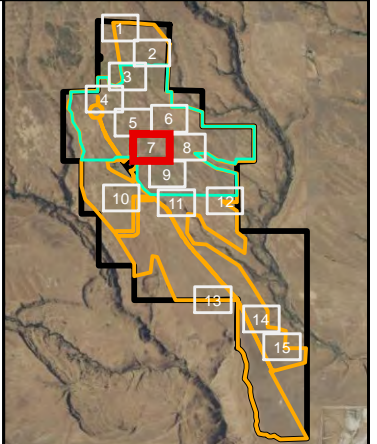
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map



















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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 8 of 15

KLICKITAT COUNTY, WASHINGTON

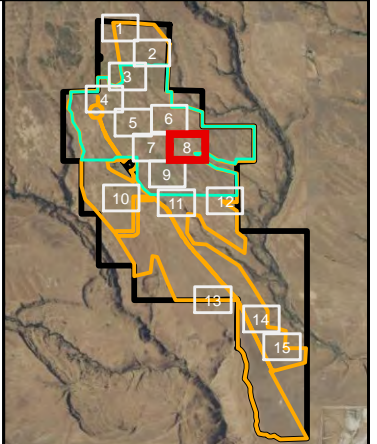
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-  Solar Facility Siting Area
-  Analyzed Project Area
-  Existing Juniper Canyon Transmission Line
-  Proposed Access Roads
-  Potential Extent of Overhead Transmission Corridor
-  Proposed O&M Facility
-  Proposed Staging/Laydown Area
-  Proposed Substation
-  Proposed Solar Array
-  Sample Plot
-  Photo Location and Direction
-  Delineated Stream
-  Stream Buffer
-  Delineated Wetland
-  Wetland Buffer



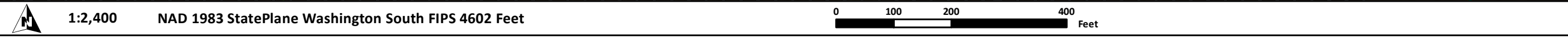
Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map



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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 9 of 15

KLICKITAT COUNTY, WASHINGTON

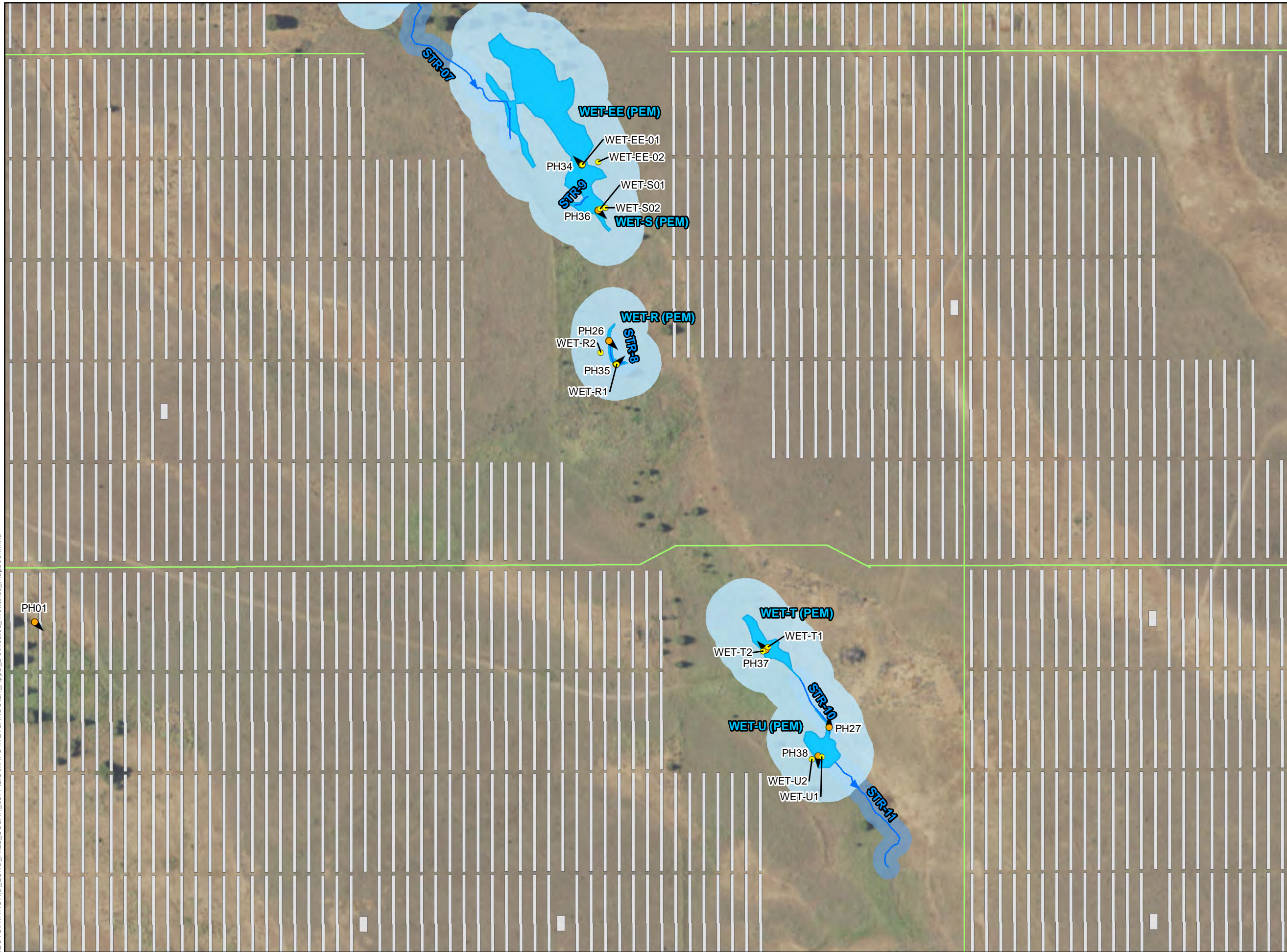
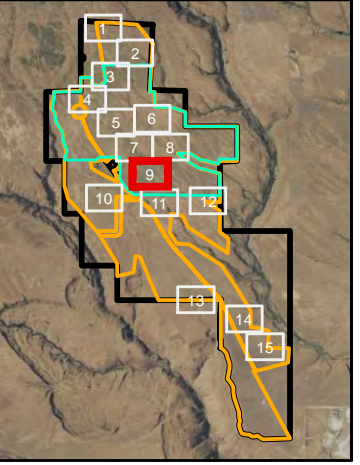
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map

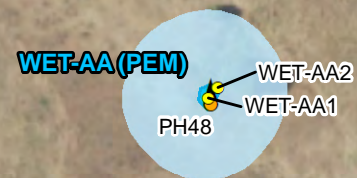
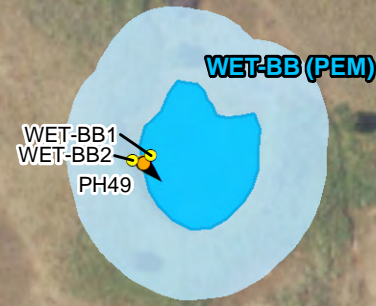


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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 10 of 15

KLICKITAT COUNTY, WASHINGTON



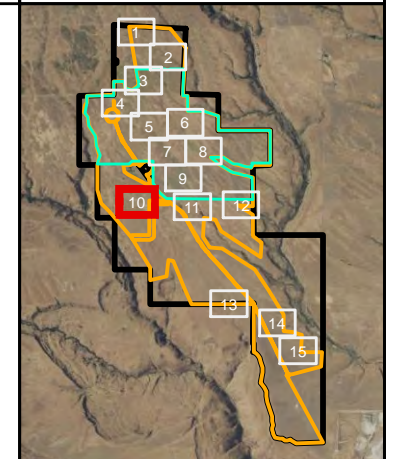
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- Proposed O&M Facility
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- Proposed Substation
- Proposed Solar Array
- Sample Plot
- Photo Location and Direction
- Delineated Stream
- Stream Buffer
- Delineated Wetland
- Wetland Buffer



Data Sources

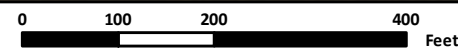
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Sample Plots, Photo Points

Reference Map



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NAD 1983 StatePlane Washington South FIPS 4602 Feet



















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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 11 of 15

KLICKITAT COUNTY, WASHINGTON

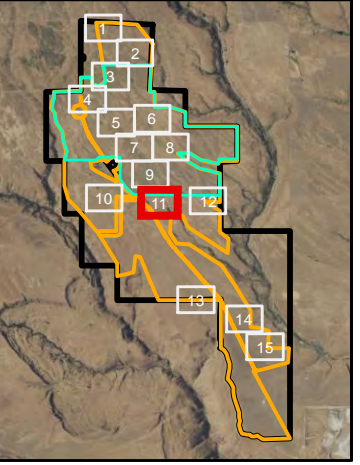
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-  Wetland Buffer



Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map



















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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 12 of 15

KLICKITAT COUNTY, WASHINGTON

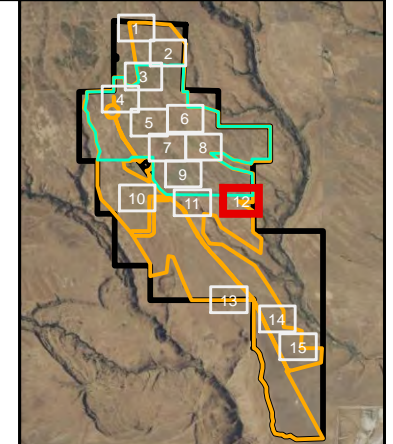
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-  Wetland Buffer



Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map



















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Lund Hill Solar Project

Delineated Wetlands and Waters Sheet 13 of 15

KLICKITAT COUNTY, WASHINGTON

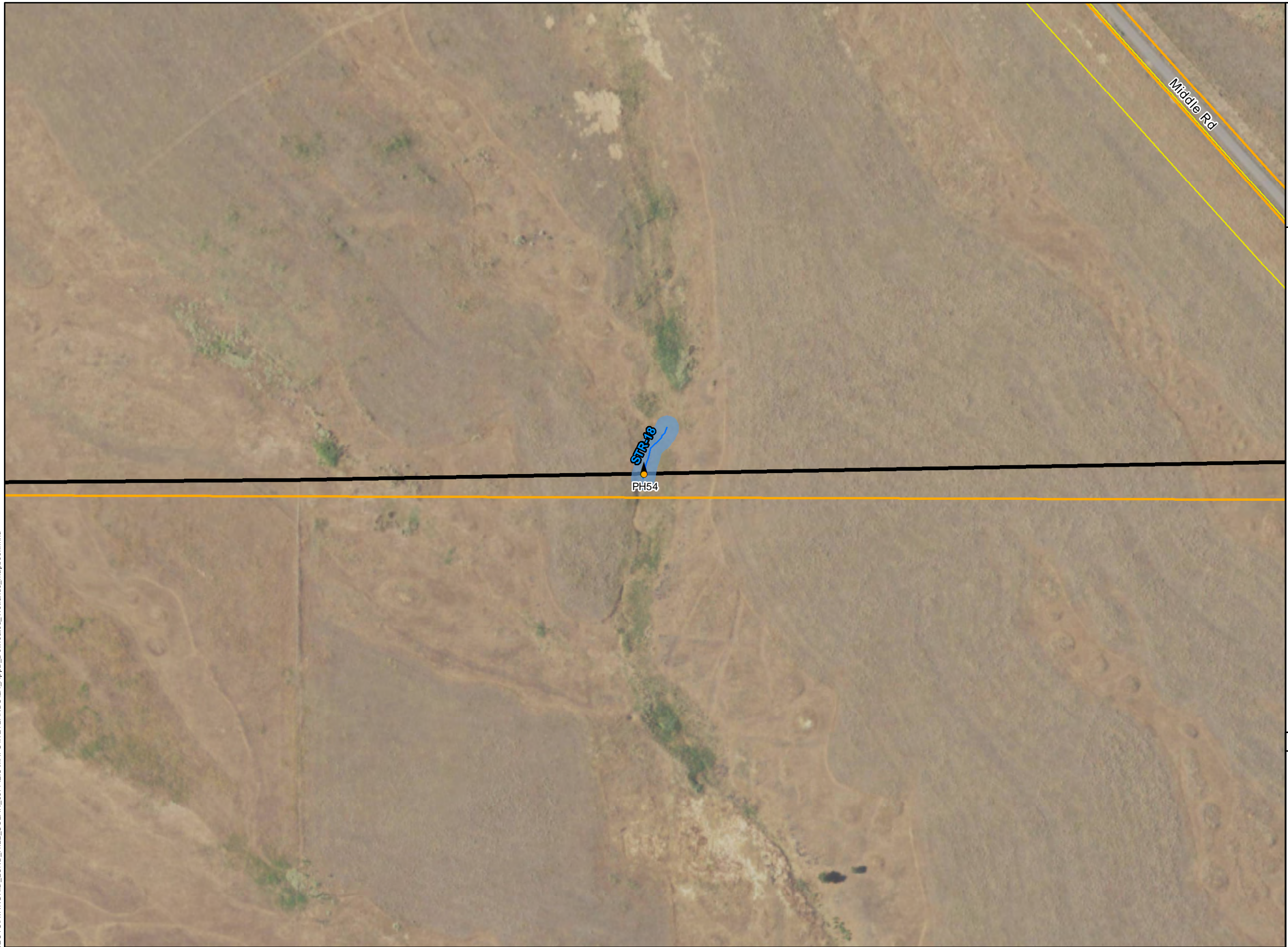
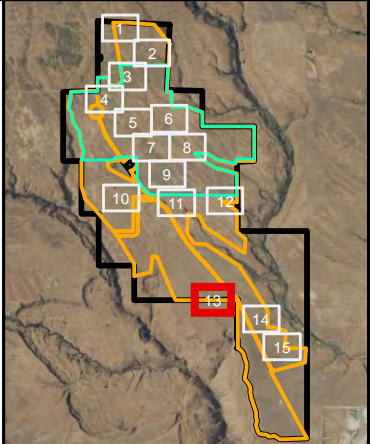
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map

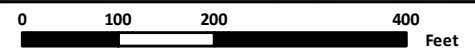


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






NAD 1983 StatePlane Washington South FIPS 4602 Feet



Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 14 of 15

KLICKITAT COUNTY, WASHINGTON

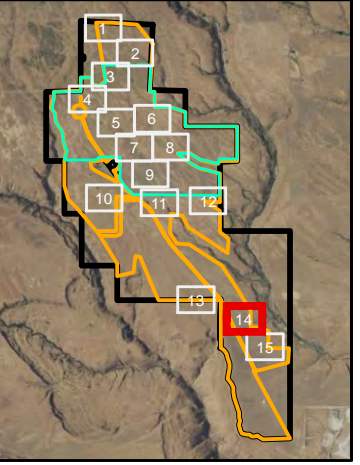
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
Tetra Tech-Delineated Wetlands, Streams,
Sample Plots, Photo Points

Reference Map



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Lund Hill Solar Project

Delimited Wetlands and Waters Sheet 15 of 15

KLICKITAT COUNTY, WASHINGTON

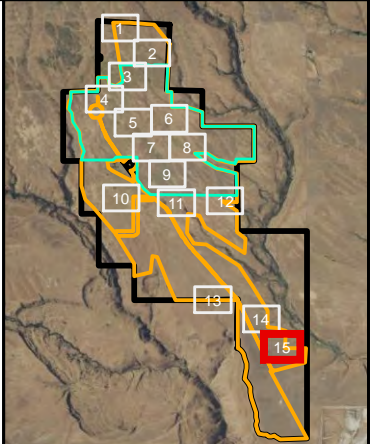
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- Existing Juniper Canyon Transmission Line
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Data Sources

Avangrid-Project Components;
USDA-NAIP Imagery 2017;
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Sample Plots, Photo Points

Reference Map

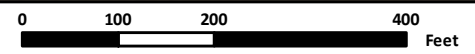


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Appendix B

Panoramic Photo Points



Photo Point 1
Middle Road, approximately 0.5 miles south of Schrantz Road



Photo Point 2
Middle Road, approximately 0.5 miles north of Schrantz Road



Photo Point 3
East Road, approximately 1 mile south of Whitmore Road



Photo Point 4
Schantz Road, approximately 1 mile west of Middle Road



Photo Point 5
East Road, approximately 0.5 miles east of Middle Road



Photo Point 6
Middle Road, approximately 0.9 miles south of East Road

Appendix C

Visual Contrast Rating Worksheets



Section A: Project Information

Project Name Lund Hill Solar	Representative Viewpoint 1	Latitude / Longitude 45° 52' 29.51" N -120° 15' 42.33" W	Notes: Located along Middle Road approximately 0.4 miles south of Schrantz Road, looking north.
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Section B: Characteristic Landscape Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat Distant hills - low, gently rolling	Grasses - Large, uniform Trees and shrubs - conical, loosely round, short and tall	Buildings - rectangular, angular Silos - round and triangular Utility poles - tall, vertical Turbines - tall, vertical, narrow, angular
LINE	Straight, horizontal Distant hills - horizontal, simple, gently undulating	Grasses - straight, long (butt edge along road) Trees - irregular, broken, vertical, branching	Buildings and Silos - straight, vertical, horizontal and angular Utility poles - straight vertical, thin Turbines - tall, straight, thin, angular
COLOR	Brown, tan Distant hill - not discernible	Grasses - yellow, sage green Trees and shrubs - Dark green, brown	Buildings and Silos - gray, brown, white, light green and green Utility poles - brown Turbines - white
TEXTURE	Fine	Fine to medium	Buildings and Silos - fine, smooth Utility poles - fine, uniform, ordered Turbines - fine, uniform, ordered

Section C: Proposed Activity Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Flat, level	Geometric and linear forms created by clearing	Solar array - low, horizontal, parallel Chain link fence - transparent, vertical, linear O&M building - rectangular, angular Substation - tall, vertical, geometric
LINE	Straight, horizontal	Strong irregular lines created by edge effect of clearing for solar array field and internal roads	Solar array - straight, parallel, regular Chain link fence - straight, regular, continuous O&M building - straight, horizontal and vertical Substation - straight, tall, angular, narrow
COLOR	Brown, tan	Yellow, sage green	Solar array - gray, sliver Chain link fence - gray O&M building - tan, beige Substation - gray
TEXTURE	Fine	Patchy	Solar array - even, ordered, directional Chain link fence - even, ordered, directional O&M building - simple, fine Substation - medium

Section D: Contrast Rating

Section E: Viewer Sensitivity

		FEATURES												VIEWER EXPECTATIONS	DURATION OF VIEW	USE VOLUME	OVERALL SENSITIVITY		
		LAND/WATER				VEGETATION				STRUCTURES				High	High	Low	High		
ELEMENTS	DEGREE OF CONTRAST	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE						
	FORM			X				X			X								
	LINE			X				X			X								
	COLOR			X				X			X								
	TEXTURE			X				X			X								
OVERALL LEVEL OF CONTRAST: Moderate																			
												ADDITIONAL COMMENTS: Even though the Project is located within the immediate foreground, the Project would be seen in the context of the existing turbines which are the dominant features in the landscape from this viewpoint location. Based on the proximity of the Project to the viewpoint the Project components will be noticeable but would be subordinate to the existing wind turbines. As such, it anticipated the Project would result in moderate contrast.							
												EVALUATORS NAMES: Lori Davidson				DATE: 1/7/2019			



VISUAL CONTRAST RATING WORKSHEET

Section A: Project Information

Project Name Lund Hill Solar	Representative Viewpoint 2	Latitude / Longitude 45° 53' 10.60" N -120° 15' 45.17" W	Notes: Located along Middle Road approximately 0.4 miles north of Schrantz Road, looking south-southeast.
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Section B: Characteristic Landscape Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat Distant hills - low, gently rolling	Grasses - Large, uniform Trees and shrubs - conical, loosely round, short and tall	Buildings - rectangular, angular Silos - round and triangular Utility poles - tall, vertical Turbines - tall, vertical, narrow, angular
LINE	Straight, horizontal Distant hills - horizontal, simple, gently undulating	Grasses - straight, long (butt edge along road) Trees - irregular, broken, vertical, branching	Buildings and Silos - straight, vertical, horizontal and angular Utility poles - straight vertical, thin Turbines - tall, straight, thin, angular
COLOR	Brown, tan Distant hill - not discernible	Grasses - yellow, sage green Trees and shrubs - Dark green, brown	Buildings and Silos - gray, brown, white, light green and green Utility poles - brown Turbines - white
TEXTURE	Fine	Fine to medium	Buildings and Silos - fine, smooth Utility poles - fine, uniform, ordered Turbines - fine, uniform, ordered

Section C: Proposed Activity Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Flat, level	Geometric and linear forms created by clearing	Solar array - low, horizontal, parallel Chain link fence - transparent, vertical, linear O&M building - rectangular, angular Substation - tall, vertical, geometric
LINE	Straight, horizontal	Strong lines created by edge effect of clearing for solar array field and internal roads	Solar array - straight, parallel, regular Chain link fence - straight, regular, continuous O&M building - straight, horizontal and vertical Substation - straight, tall, angular, narrow
COLOR	Brown, tan	Yellow, sage green	Solar array - gray, sliver Chain link fence - gray O&M building - tan, beige Substation - gray
TEXTURE	Fine	Patchy	Solar array - even, ordered, directional Chain link fence - even, ordered, directional O&M building - simple, fine Substation - medium

Section D: Contrast Rating

Section E: Viewer Sensitivity

		FEATURES												VIEWER EXPECTATIONS	DURATION OF VIEW	USE VOLUME	OVERALL SENSITIVITY		
		LAND/WATER				VEGETATION				STRUCTURES				Low	Low	Low	Low		
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE						
ELEMENTS	DEGREE OF CONTRAST			X				X				X							
	FORM			X				X				X							
	LINE			X				X				X							
	COLOR			X				X				X							
TEXTURE			X				X				X								
OVERALL LEVEL OF CONTRAST: Moderate																			
												ADDITIONAL COMMENTS: The Project would be seen in the context of the existing wind turbines which are currently the dominant feature in the landscape. Based on the proximity of the Project to the viewpoint the Project components will be noticeable but would be subordinate to the existing wind turbines. Therefore, it is anticipated the Project would result in moderate contrast. Furthermore, contrast would be reduced by the short view duration of the travelers along the roadway.							
												EVALUATORS NAMES: Lori Davidson				DATE: 1/7/2019			



VISUAL CONTRAST RATING WORKSHEET

Section A: Project Information

Project Name Lund Hill Solar	Representative Viewpoint 3	Latitude / Longitude 45° 51' 48.27" N -120° 11' 58.78" W	Notes: Located along East Road approximately 1 mile south of Whitmore Road, looking west.
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Section B: Characteristic Landscape Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat to moderately steep	Grasses - uniform Trees and shrubs - round, conical, short and tall	Fence - short, straight, thin, transparent Utility poles - tall, vertical Turbines - tall, vertical, narrow, angular Paved road - flat, horizontal
LINE	Straight, horizontal, angular	Grasses - straight, long (butt edge along road) Trees and shrubs - irregular, broken	Fence - short, thin Utility poles - straight vertical, thin, parallel Turbines - tall, straight, thin, angular Paved road - parallel, straight, directional
COLOR	Brown, tan	Grasses - yellow, sage green Trees and shrubs - Dark green	Fence - brown and gray Utility poles - brown Turbines - white Paved road - dark gray, white, yellow
TEXTURE	Fine to moderate	Fine to medium, clumped (grasses), scattered (trees/shrubs)	Fence - fine Utility poles - fine, uniform, ordered Turbines - fine, uniform, ordered Paved road - simple and fine

Section C: Proposed Activity Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Flat, level	Geometric and linear forms created by clearing	Solar array - low, horizontal, parallel Chain link fence - transparent, vertical, linear Substation - low, vertical, geometric O&M building - not visible
LINE	Straight, horizontal	Lines created by edge effect of clearing for solar array field and internal roads	Solar array - straight, parallel, undulating Chain link fence - straight, regular, continuous Substation - not discernible O&M building - not visible
COLOR	Brown, tan	Yellow, sage green	Solar array - gray, sliver Chain link fence - gray Substation - not discernible O&M building - not discernible
TEXTURE	Fine	Patchy	Solar array - even, ordered, directional Chain link fence - even, ordered, directional Substation - not discernible O&M building - not discernible

Section D: Contrast Rating

Section E: Viewer Sensitivity

		FEATURES												VIEWER EXPECTATIONS	DURATION OF VIEW	USE VOLUME	OVERALL SENSITIVITY
		LAND/WATER				VEGETATION				STRUCTURES				Low	Low	Low	Low
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE				
ELEMENTS	DEGREE OF CONTRAST																
	FORM			X				X					X				
	LINE			X				X					X				
	COLOR			X				X					X				
	TEXTURE			X				X				X					
		OVERALL LEVEL OF CONTRAST: Weak												ADDITIONAL COMMENTS: The solar array would create a thin, dark line on or near the horizon and would attract little attention in the context of the existing wind turbines. The O&M building and substation would be mostly screened by topography and the solar array. As such, it is anticipated that the Project would introduce weak contrast. Contrast would be further reduced by the short viewing duration as travelers will be approaching or parallel to the Project for a limited time.			
														EVALUATORS NAMES: Lori Davidson		DATE: 1/7/2019	



VISUAL CONTRAST RATING WORKSHEET

Section A: Project Information

Project Name Lund Hill Solar	Representative Viewpoint 4	Latitude / Longitude 45° 52' 52.36" N -120° 16' 59.54"W	Notes: Located along Schrantz Road approximately 1 mile west of Middle Road, looking east.
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Section B: Characteristic Landscape Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat to gently rolling	Grasses – uniform, irregular patches Trees (in distance) – round, conical	Fence – short, straight, thin, transparent Utility poles – tall, vertical, angular Turbines – tall, vertical, narrow, angular Road – flat, horizontal Houses/Silos – rectangular, round, triangular
LINE	Straight, horizontal, curving	Grasses – straight, long (butt edge along road) Trees – irregular and angular, broken	Fence – short, thin, directional Utility poles – straight vertical, thin, parallel, angular Turbines – tall, straight, thin, angular Paved road – parallel, straight, directional Houses/Silos – straight, vertical, angular
COLOR	Brown, tan	Grasses – yellow, sage green, dark green Trees and shrubs - Dark green	Fence – gray and white Utility poles – brown Turbines – white Paved road – brown, tan Houses/Silos – white, gray
TEXTURE	Fine to moderate	Fine	Fence – fine Utility poles – fine, simple, uniform, ordered Turbines – fine, simple, uniform, ordered Road – simple and fine Houses/Silos – fine

Section C: Proposed Activity Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Flat, level	Geometric and linear forms created by clearing	Solar array – low, horizontal Chain link fence – transparent, vertical, linear Substation – vertical, geometric O&M building – low, horizontal
LINE	Straight, horizontal	Lines created by edge effect of clearing for solar array field and internal roads	Solar array – straight, parallel, regular Chain link fence – straight, regular, continuous Substation – straight, angular, narrow O&M building – straight, horizontal, diagonal
COLOR	Brown, tan	Yellow, sage green	Solar array – gray, sliver Chain link fence – gray Substation – gray O&M building – tan, beige
TEXTURE	Fine	Patchy	Solar array – even, ordered, directional Chain link fence – even, ordered, directional Substation – fine O&M building – fine

Section D: Contrast Rating

Section E: Viewer Sensitivity

		FEATURES												VIEWER EXPECTATIONS	DURATION OF VIEW	USE VOLUME	OVERALL SENSITIVITY
ELEMENTS	DEGREE OF CONTRAST	LAND/WATER				VEGETATION				STRUCTURES				Low	Low	Low	Low
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE				
	FORM				X			X					X				
	LINE				X			X			X						
	COLOR				X			X					X				
	TEXTURE				X			X					X				
		OVERALL LEVEL OF CONTRAST: Weak												ADDITIONAL COMMENTS The solar array would appear as a dark geometric feature along the horizon and would most likely screen the lower portions of the O&M building and substation equipment. The portions of these features that are visible would be seen in the context of several vertical features in the landscape. Due to the proximity and number of turbines and utility lines to the viewer, it is anticipated that contrast introduced by the Project would be weak.			
		EVALUATORS NAMES: Lori Davidson												DATE: 1/7/2019			



Section A: Project Information

Project Name Lund Hill Solar	Representative Viewpoint 5	Latitude / Longitude 45° 49' 15.99"N -120° 11' 57.01"W	Notes: Located along East Road approximately 0.5 mile east of the East Road/Middle Road intersection, looking north.
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Section B: Characteristic Landscape Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat to gently rolling Distant hill - low, gently rolling	Grasses - uniform, irregular patches Trees and shrubs - round, conical	Utility poles - tall, vertical, narrow Turbines - tall, vertical, narrow, angular Road - flat, horizontal Houses/Silos - not discernible
LINE	Straight, horizontal, curving Distant hills - thin, horizontal, simple, gently undulating	Grasses - straight, long (butt edge along road) Trees and shrubs - irregular round, broken	Utility poles - straight vertical, thin, parallel, angular Turbines - tall, straight, thin, angular Paved road - parallel, straight, directional Houses/Silos - not discernible
COLOR	Brown, tan Distant hill - not discernible	Grasses - yellow, sage green, green Trees and shrubs - green, dark green	Utility poles - brown Turbines - white Paved road - brown, tan Houses/Silos - not discernible
TEXTURE	Fine to moderate	Fine, clumped, stippled	Utility poles - fine, simple, uniform, ordered Turbines - fine, simple, uniform, ordered Road - simple and fine Houses/Silos - not discernible

Section C: Proposed Activity Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat to gently rolling	Geometric and linear forms created by clearing	Solar array - low, horizontal Chain link fence - not discernible Substation - vertical, geometric O&M building - low, horizontal
LINE	Straight, horizontal, curving	Lines created by edge effect of clearing for solar array field and internal roads	Solar array - straight, parallel, regular Chain link fence - not discernible Substation - short, straight, angular, narrow O&M building - short, straight, horizontal,
COLOR	Brown, tan	Yellow, sage green	Solar array - gray, sliver Chain link fence - not discernible Substation - not discernible O&M building - not discernible
TEXTURE	Fine	Patchy	Solar array - even, ordered, directional Chain link fence - not discernible Substation - not discernible O&M building - not discernible

Section D: Contrast Rating

Section E: Viewer Sensitivity

		FEATURES												VIEWER EXPECTATIONS	DURATION OF VIEW	USE VOLUME	OVERALL SENSITIVITY	
		LAND/WATER				VEGETATION				STRUCTURES				Low	Low	Low	Low	
ELEMENTS	DEGREE OF CONTRAST	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	ADDITIONAL COMMENTS				
	FORM				X				X				X		The solar array would appear as a dark geometric feature along the horizon and would most likely screen the lower portions of the O&M building and substation equipment. The portions of these features that are visible would be seen in the context of several vertical features in the landscape. Due to the distance of the Project to the viewpoint location and the presence of the turbines, it is anticipated that contrast introduced by the Project would be weak.			
	LINE				X				X				X					
	COLOR				X				X				X					
	TEXTURE				X				X				X					
OVERALL LEVEL OF CONTRAST: Weak																		
												EVALUATORS NAMES: Lori Davidson		DATE: 1/7/2019				



VISUAL CONTRAST RATING WORKSHEET

Section A: Project Information

Project Name Lund Hill Solar	Representative Viewpoint 6	Latitude / Longitude 45° 48' 24.00"N -120° 11' 56.00"W	Notes: Located along Middle Road approximately 0.9 mile south of the East Road/Middle Road intersection, looking north.
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Section B: Characteristic Landscape Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat to gently rolling Distant hill - low, gently rolling	Grasses - uniform, irregular patches Trees and shrubs - round, conical, irregular patches	Fence - shorth, straight, thin, transparent Utility poles - tall, vertical, narrow Turbines - tall, vertical, narrow, angular Road - flat, horizontal, narrow Houses/Silos - not discernible
LINE	Straight, horizontal, curving Distant hills - thin, horizontal, simple	Grasses - straight, long (butt edge along road) Trees and shrubs - irregular round, broken	Fence - short, thin Utility poles - straight vertical, thin, parallel Turbines - tall, straight, thin, angular Paved road - parallel, straight, directional Houses/Silos - not discernible
COLOR	Brown, tan Distant hill - not discernible	Grasses - yellow, sage green, green Trees and shrubs - green, dark green	Fence - brownish red, white Utility poles - brown Turbines - white Paved road - dark gray, yellow Houses/Silos - not discernible
TEXTURE	Fine to moderate	Fine, clumped, stippled,	Fence - fine Utility poles - fine, simple, uniform, ordered Turbines - fine, simple, uniform Road - simple and fine Houses/Silos - not discernible

Section C: Proposed Activity Description

	LAND / WATER	VEGETATION	STRUCTURES
FORM	Level, flat to gently rolling	Geometric and linear forms created by clearing	Solar array - low, horizontal Chain link fence - not discernible Substation - not discernible O&M building - not discernible
LINE	Straight, horizontal, curving	Lines created by edge effect of clearing for solar array field and internal roads	Solar array - thin, straight Chain link fence - not discernible Substation - not discernible O&M building - not discernible
COLOR	Brown, tan	Yellow, sage green	Solar array - gray, sliver Chain link fence - not discernible Substation - not discernible O&M building - not discernible
TEXTURE	Fine	Patchy	Solar array - even, ordered, directional Chain link fence - not discernible Substation - not discernible O&M building - not discernible

Section D: Contrast Rating

Section E: Viewer Sensitivity

		FEATURES												VIEWER EXPECTATIONS	DURATION OF VIEW	USE VOLUME	OVERALL SENSITIVITY	
		LAND/WATER				VEGETATION				STRUCTURES				Low	Low	Low	Low	
ELEMENTS	DEGREE OF CONTRAST	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	ADDITIONAL COMMENTS				
	FORM				X				X				X		The solar array would appear as a dark thin line along the horizon. At this distance it is anticipated that the O&M building and substation would not be discernible or noticeable to the casual observer. Due to the distance of the Project to the viewpoint location it is anticipated that contrast introduced by the Project would be weak.			
	LINE				X			X				X						
	COLOR				X			X				X						
	TEXTURE				X			X				X						
OVERALL LEVEL OF CONTRAST: Weak													EVALUATORS NAMES: Lori Davidson					

Appendix D







Post-construction Conditions Simulations

LUND HILL SOLAR PROJECT

Visual Simulation East Road

Viewing Location:



-  Photo Location
-  Solar Siting Facility Area
-  Analyzed Project Area
-  Staging/Laydown Area
-  O&M Facility Site
-  Substation Site

PHOTOGRAPH INFORMATION

View Location: East Road, approximately 1 mile south of Whitmore Road.

Date of photograph: 12/27/2018

Time of photograph: 12:41 PM

Weather Condition: Cloudy

Viewing Direction: West

Latitude: 45° 51' 48.27"N

Longitude: -120° 11' 58.79"W



Existing condition



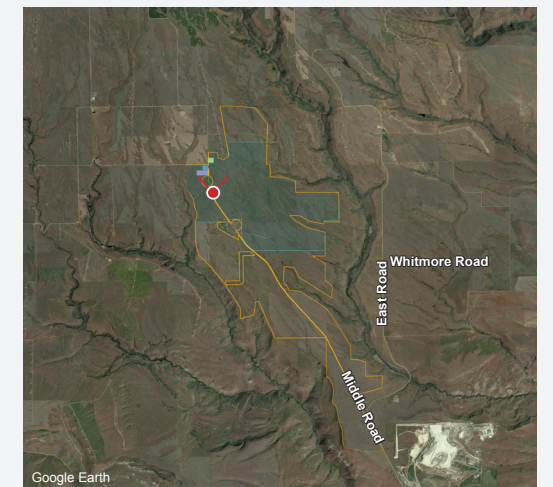
Simulated condition

White brackets in the above photograph depict the extents of the solar array field.

LUND HILL SOLAR PROJECT

Visual Simulation Middle Road

Viewing Location:



Existing condition



Simulated condition

The yellow and red arrows in the above photograph depict the approximate location of the operations and maintenance building and substation, respectively.

PHOTOGRAPH INFORMATION

View Location: Middle Road, approximately 0.4 mile south of Schrantz Road.

Date of photograph: 12/27/2018

Time of photograph: 1:35 PM

Weather Condition: Cloudy

Viewing Direction: North-northeast

Latitude: 45° 52' 29.51"N

Longitude: -120° 15' 42.33"W



Appendix E

Facility Decommissioning Cost Assumptions

Estimate Summary

TETRA TECH EC, INC.

Job Code: Lund Hill Solar

Description: Decommissioning Estimate

Cost Item								
CBS Position Code	Quantity UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
1	1.00 Each	LUND HILL SOLAR RETIREMENT	837.72	0.00	Detail	U.S. Dollar	7,166,525.35	7,166,525.35
1.1	1.00 Lump Sum	Mob / Demob	5.00	0.20	Detail	U.S. Dollar	123,728.59	123,728.59
1.1.1	1.00 Lump Sum	Equipment Mob	0.00	0.00	Detail	U.S. Dollar	61,200.00	61,200.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
UERNTRLG	Rental Equip Transp-Large		6.00 Each	U.S. Dollar	10,000.00	60,000.00		
UERNTRSM	Rental Equip Transp-Small		8.00 Each	U.S. Dollar	150.00	1,200.00		
1.1.2	1.00 Lump Sum	Site Facilities	0.00	0.00	Detail	U.S. Dollar	2,200.00	2,200.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
UOCONMOB	Connex Box Mob		2.00 Each	U.S. Dollar	300.00	600.00		
UOTRLTRN	Trailer Trmsp/Setup/Trdwn		2.00 Each	U.S. Dollar	800.00	1,600.00		
1.1.3	3.00 Day	Crew Mob & Site Setup	3.00	1.00	Detail	U.S. Dollar	12,065.72	36,197.15
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	720.00	24.00 Each (hourly)	U.S. Dollar	38.04	27,386.82		
L010101	OPERATOR	180.00	6.00 Each (hourly)	U.S. Dollar	48.95	8,810.33		
1.1.4	2.00 Day	Crew Demob & Site Cleanup	2.00	1.00	Detail	U.S. Dollar	12,065.72	24,131.44
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	480.00	24.00 Each (hourly)	U.S. Dollar	38.04	18,257.88		
L010101	OPERATOR	120.00	6.00 Each (hourly)	U.S. Dollar	48.95	5,873.56		
1.2	8.00 Month	Site Facilities	0.00	0.00	Detail	U.S. Dollar	2,155.00	17,240.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
URCONNEX	Connex Box		16.00 Month	U.S. Dollar	150.00	2,400.00		
UROFFTRL	Office Trailer -12x60		8.00 Month	U.S. Dollar	500.00	4,000.00		
UO1STAIID	1st Aid Supplies		8.00 Month	U.S. Dollar	300.00	2,400.00		
UOOFFPHN	Monthly Office Phone		8.00 Month	U.S. Dollar	500.00	4,000.00		
UOOFFSUP	Office Supplies(\$/prs/mo)		8.00 Month	U.S. Dollar	55.00	440.00		
UINTE	Internet		8.00 Month	U.S. Dollar	200.00	1,600.00		
URPRTAJH	Port-a-John Unit(s) (4)		8.00 Month	U.S. Dollar	300.00	2,400.00		
1.3	32.00 Week	Field Management	192.00	0.17	Detail	U.S. Dollar	21,851.73	699,255.40
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L90FXX02	Field - Proj Superintendent	1,920.00	1.00 Each (hourly)	U.S. Dollar	83.18	159,709.44		
RPUTRK05	F-250 4X4 3/4 TON PICKUP	9,600.00	5.00 Each (hourly)	U.S. Dollar	11.07	106,224.00		
L90FEL00	Field - Engr. Tech	1,920.00	1.00 Each (hourly)	U.S. Dollar	39.57	75,982.12		
L90FXX03	Field - SHSO	1,920.00	1.00 Each (hourly)	U.S. Dollar	89.26	171,386.69		
L90FEJ00	Field - Asst. Engr.	3,840.00	2.00 Each (hourly)	U.S. Dollar	48.43	185,953.15		
1.4	1.00 Lump Sum	Substation Retirement	30.95	0.03	Detail	U.S. Dollar	228,228.50	228,228.50
1.4.1	1.00 Day	Fence Removal	1.00	1.00	Detail	U.S. Dollar	1,202.19	1,202.19
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L010101	OPERATOR	10.00	1.00 Each (hourly)	U.S. Dollar	48.95	489.46		
L060100	GENERAL LABORER	10.00	1.00 Each (hourly)	U.S. Dollar	38.04	380.37		
RBACKH09	Deere 710J BACKHOE, 1.62CY	10.00	1.00 Each (hourly)	U.S. Dollar	33.24	332.35		
1.4.2	2.00 Each	Transformer Removal	12.00	0.17	Detail	U.S. Dollar	72,199.33	144,398.65

Cost Item								
CBS Position Code	Quantity UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
1.4.2.1	2.00 Each	Oil Removal & Disposal	2.00	1.00	Detail	U.S. Dollar	58,135.75	116,271.49
1.4.2.1.1	2.00 Each	Oil Removal	2.00	1.00	Detail	U.S. Dollar	760.75	1,521.49
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	40.00	2.00 Each (hourly)	U.S. Dollar	38.04	1,521.49		
1.4.2.1.2	28,000.00 Gallon	Oil Disposal	0.00	0.00	Detail	U.S. Dollar	4.00	112,000.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USDISPOSAL	Disposal Fee's		112,000.00 Each	U.S. Dollar	1.00	112,000.00		
1.4.2.1.3	2.00 Each	Trucking - Per Load	0.00	0.00	Detail	U.S. Dollar	1,375.00	2,750.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USTRUCKING	Trucking Sub		2,750.00 Each	U.S. Dollar	1.00	2,750.00		
1.4.2.2	2.00 Each	Dismantle & Loadout Transformer	10.00	0.20	Detail	U.S. Dollar	14,063.58	28,127.16
1.4.2.2.1	2.00 Each	Dismantle, Cut & Size	10.00	0.20	Detail	U.S. Dollar	28,003.58	56,007.16
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	400.00	4.00 Each (hourly)	U.S. Dollar	38.04	15,214.90		
L010101	OPERATOR	200.00	2.00 Each (hourly)	U.S. Dollar	48.95	9,789.26		
*REXCAV06A	Excav 100K w/ Bucket & Grapple	100.00	1.00 Each (hourly)	U.S. Dollar	124.54	12,453.50		
*REXCAV06E	Excav 100K w/ Shear	100.00	1.00 Each (hourly)	U.S. Dollar	185.50	18,549.50		
1.4.2.2.2	8.00 Each	Trucking - Per Load	0.00	0.00	Detail	U.S. Dollar	1,375.00	11,000.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USTRUCKING	Trucking Sub		11,000.00 Each	U.S. Dollar	1.00	11,000.00		
1.4.2.2.3	180.00 Ton	Scrap Credit	0.00	0.00	Detail	U.S. Dollar	(216.00)	(38,880.00)
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
UODCFERROUS	Ferrous Metal Scrap		180.00 Ton	U.S. Dollar	(216.00)	(38,880.00)		
1.4.3	1.00 Each	Remove Control Building	0.50	2.00	Detail	U.S. Dollar	2,432.59	2,432.59
1.4.3.1	1.00 Each	Demo	0.50	2.00	Detail	U.S. Dollar	1,057.59	1,057.59
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	5.00	1.00 Each (hourly)	U.S. Dollar	38.04	190.19		
L010101	OPERATOR	5.00	1.00 Each (hourly)	U.S. Dollar	48.95	244.73		
*REXCAV06A	Excav 100K w/ Bucket & Grapple	5.00	1.00 Each (hourly)	U.S. Dollar	124.54	622.68		
1.4.3.2	1.00 Each	Trucking - Per Load	0.00	0.00	Detail	U.S. Dollar	1,375.00	1,375.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USTRUCKING	Trucking Sub		1,375.00 Each	U.S. Dollar	1.00	1,375.00		
1.4.4	2.00 Day	UG Utility & Ground Removal	2.00	1.00	Detail	U.S. Dollar	1,202.19	2,404.37
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L010101	OPERATOR	20.00	1.00 Each (hourly)	U.S. Dollar	48.95	978.93		
L060100	GENERAL LABORER	20.00	1.00 Each (hourly)	U.S. Dollar	38.04	760.75		
RBACKH09	Deere 710J BACKHOE, 1.62CY	20.00	1.00 Each (hourly)	U.S. Dollar	33.24	664.70		
1.4.5	500.00 Cubic Yard	Remove Foundations To Subgrade	6.79	73.68	Detail	U.S. Dollar	27.02	13,512.25

Cost Item								
CBS Position Code	Quantity UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
1.4.5.1	500.00 Cubic Yard	Excavate / Remove Foundation - Various Depth	1.79	280.00	Detail	U.S. Dollar	15.05	7,525.53
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	17.86	1.00 Each (hourly)	U.S. Dollar	38.04	679.24		
L010101	OPERATOR	35.71	2.00 Each (hourly)	U.S. Dollar	48.95	1,748.08		
*REXCAV06C	Excav 100K w/ Hammer	17.86	1.00 Each (hourly)	U.S. Dollar	160.97	2,874.38		
*REXCAV06A	Excav 100K w/ Bucket & Grapple	17.86	1.00 Each (hourly)	U.S. Dollar	124.54	2,223.84		
1.4.5.2	500.00 Cubic Yard	Concrete Transport Offsite	5.00	100.00	Detail	U.S. Dollar	11.97	5,986.72
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
RDUTRK06	CAT D350D, 18CY-24CY	50.00	1.00 Each (hourly)	U.S. Dollar	74.29	3,714.50		
L080940	TEAMSTER	50.00	1.00 Each (hourly)	U.S. Dollar	45.44	2,272.22		
1.4.6	1.00 Lump Sum	Misc. Material Disposal	0.00	0.00	Detail	U.S. Dollar	1,675.00	1,675.00
1.4.6.1	1.00 Each	Trucking - Per Load	0.00	0.00	Detail	U.S. Dollar	1,375.00	1,375.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USTRUCKING	Trucking Sub		1,375.00 Each	U.S. Dollar	1.00	1,375.00		
1.4.6.2	10.00 Ton	Disposal Cost	0.00	0.00	Detail	U.S. Dollar	30.00	300.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USDISPOSAL	Disposal Fee's		300.00 Each	U.S. Dollar	1.00	300.00		
1.4.7	1.00 Lump Sum	Restore Yard	8.67	0.12	Detail	U.S. Dollar	62,603.46	62,603.46
1.4.7.1	4.00 Acre	Backfill / Regrade	2.00	2.00	Detail	U.S. Dollar	1,540.15	6,160.62
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	40.00	2.00 Each (hourly)	U.S. Dollar	38.04	1,521.49		
L010101	OPERATOR	40.00	2.00 Each (hourly)	U.S. Dollar	48.95	1,957.85		
REXCAV06B	Gradall - Excavator	20.00	1.00 Each (hourly)	U.S. Dollar	75.73	1,514.57		
*RDOZER08	CAT D6 LGP Dozer	20.00	1.00 Each (hourly)	U.S. Dollar	58.34	1,166.70		
1.4.7.2	2,000.00 Cubic Yard	Vegetative Cover	6.67	300.00	Detail	U.S. Dollar	27.22	54,442.84
1.4.7.2.1	2,000.00 Cubic Yard	Topsoil, Delivered	0.00	0.00	Detail	U.S. Dollar	20.00	40,000.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
IMSOIL	Topsoil		2,000.00 Cubic Yard	U.S. Dollar	20.00	40,000.00		
1.4.7.2.2	2,000.00 Cubic Yard	Placement	6.67	300.00	Detail	U.S. Dollar	7.22	14,442.84
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L010101	OPERATOR	133.33	2.00 Each (hourly)	U.S. Dollar	48.95	6,526.17		
RDOZER08	CAT D6N XL	133.33	2.00 Each (hourly)	U.S. Dollar	59.38	7,916.67		
1.4.7.3	4.00 Acre	Re-Seed With Native Vegetation	0.00	0.00	Detail	U.S. Dollar	500.00	2,000.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USLANDSCAPE	Landscape Sub		4.00 Acre	U.S. Dollar	500.00	2,000.00		
1.5	1.00 Lump Sum	Transmission Line Retirement	82.56	0.01	Detail	U.S. Dollar	299,434.42	299,434.42
1.5.1	5.00 Mile	Conductor Removal	30.00	0.17	Detail	U.S. Dollar	24,115.77	120,578.83
1.5.1.1	5.00 Mile	Cut / Lower Cable, Size & Loadout	30.00	0.17	Detail	U.S. Dollar	30,005.77	150,028.83
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	1,800.00	6.00 Each (hourly)	U.S. Dollar	38.04	68,467.05		

Cost Item								
CBS Position Code	Quantity UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
L010101	OPERATOR		600.00	2.00	Each (hourly)	U.S. Dollar	48.95	29,367.78
*RXMISC14	MAN LIFT GAS 125ft		300.00	1.00	Each (hourly)	U.S. Dollar	53.52	16,056.00
RLIFTS05	JCB 508C, 8,000lbs FRKLFT		300.00	1.00	Each (hourly)	U.S. Dollar	21.65	6,493.50
*RXMISC19	Material Handler		300.00	1.00	Each (hourly)	U.S. Dollar	98.82	29,644.50
1.5.1.2	10.00 Each	Trucking - Per Load		0.00	0.00 Detail	U.S. Dollar	1,375.00	13,750.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USTRUCKING	Trucking Sub		13,750.00 Each	U.S. Dollar	1.00	13,750.00		
Notes: ***** Total weight for cable, 40 ton per mile Assume 20 ton per load for trucking *****								
1.5.1.3	200.00 Ton	Scrap Credit		0.00	0.00 Detail	U.S. Dollar	(216.00)	(43,200.00)
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
UODCFERROUS	Ferrous Metal Scrap		200.00 Ton	U.S. Dollar	(216.00)	(43,200.00)		
1.5.2	26.00 Each	Structure Removal		26.00	1.00 Detail	U.S. Dollar	2,258.64	58,724.66
1.5.2.1	26.00 Each	Cut / Lower Structure		13.00	2.00 Detail	U.S. Dollar	1,727.63	44,918.29
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	520.00	4.00 Each (hourly)	U.S. Dollar	38.04	19,779.37		
L010101	OPERATOR	130.00	1.00 Each (hourly)	U.S. Dollar	48.95	6,363.02		
*RXMISC14	MAN LIFT GAS 125ft	130.00	1.00 Each (hourly)	U.S. Dollar	53.52	6,957.60		
*RXMISC23	GROVE RT 200 TON	130.00	1.00 Each (hourly)	U.S. Dollar	90.91	11,818.30		
1.5.2.2	26.00 Each	Cut / Size Structure & Loadout		13.00	2.00 Detail	U.S. Dollar	1,840.40	47,850.37
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	780.00	6.00 Each (hourly)	U.S. Dollar	38.04	29,669.06		
L010101	OPERATOR	130.00	1.00 Each (hourly)	U.S. Dollar	48.95	6,363.02		
*RXMISC23	GROVE RT 200 TON	130.00	1.00 Each (hourly)	U.S. Dollar	90.91	11,818.30		
1.5.2.3	12.00 Each	Trucking - Per Load		0.00	0.00 Detail	U.S. Dollar	1,375.00	16,500.00
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
USTRUCKING	Trucking Sub		16,500.00 Each	U.S. Dollar	1.00	16,500.00		
Notes: ***** Total weight for structures, 234 ton Assume 20 ton per load for trucking *****								
1.5.2.4	234.00 Ton	Scrap Credit		0.00	0.00 Detail	U.S. Dollar	(216.00)	(50,544.00)
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
UODCFERROUS	Ferrous Metal Scrap		234.00 Ton	U.S. Dollar	(216.00)	(50,544.00)		
1.5.3	26.00 Each	Remove Foundations To Subgrade		26.56	0.98 Detail	U.S. Dollar	4,620.42	120,130.93
1.5.3.1	26.00 Each	Excavate / Remove Foundation - Various Depth		26.00	1.00 Detail	U.S. Dollar	4,594.67	119,461.45
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		
L060100	GENERAL LABORER	520.00	2.00 Each (hourly)	U.S. Dollar	38.04	19,779.37		
L010101	OPERATOR	520.00	2.00 Each (hourly)	U.S. Dollar	48.95	25,452.08		
*REXCAV06C	Excav 100K w/ Hammer	260.00	1.00 Each (hourly)	U.S. Dollar	160.97	41,850.90		
*REXCAV06A	Excav 100K w/ Bucket & Grapple	260.00	1.00 Each (hourly)	U.S. Dollar	124.54	32,379.10		
1.5.3.2	41.94 Cubic Yard	Concrete Transport Offsite		0.56	75.00 Detail	U.S. Dollar	15.96	669.48
Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost		

Cost Item										
CBS Position Code	Quantity	UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost	
RDUTRK06	CAT D350D, 18CY-24CY			5.59	1.00	Each (hourly)	U.S. Dollar	74.29	415.38	
L080940	TEAMSTER			5.59	1.00	Each (hourly)	U.S. Dollar	45.44	254.10	
1.6	1.00	Lump Sum	Solar Array Retirement		335.51	0.00	Detail	U.S. Dollar	3,758,687.63	3,758,687.63
1.6.1	50,000.00	Linear Feet	Fence Removal		9.76	5,124.80	Detail	U.S. Dollar	0.93	46,320.58
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
L010101	OPERATOR	292.69	3.00	Each (hourly)	U.S. Dollar	48.95	14,326.31			
L060100	GENERAL LABORER	585.39	6.00	Each (hourly)	U.S. Dollar	38.04	22,266.58			
RBACKH09	Deere 710J BACKHOE, 1.62CY	292.69	3.00	Each (hourly)	U.S. Dollar	33.24	9,727.70			
1.6.2	45.00	Each	Inverter / Transformer Removal		90.00	0.50	Detail	U.S. Dollar	121.67	5,475.11
1.6.2.1	45.00	Each	Disconnect Electrical		45.00	1.00	Detail	U.S. Dollar	1,050.92	47,291.22
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
L010110	ELECTRICIAN	450.00	1.00	Each (hourly)	U.S. Dollar	55.99	25,195.21			
L060100	GENERAL LABORER	450.00	1.00	Each (hourly)	U.S. Dollar	38.04	17,116.76			
RPUTRK05	F-250 4X4 3/4 TON PICKUP	450.00	1.00	Each (hourly)	U.S. Dollar	11.07	4,979.25			
1.6.2.2	45.00	Each	Loadout Inverter & Transformer		45.00	1.00	Detail	U.S. Dollar	2,663.75	119,868.89
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
L060100	GENERAL LABORER	1,800.00	4.00	Each (hourly)	U.S. Dollar	38.04	68,467.05			
L010101	OPERATOR	450.00	1.00	Each (hourly)	U.S. Dollar	48.95	22,025.84			
RHYDCR06	GROVE RT880 73 TON	450.00	1.00	Each (hourly)	U.S. Dollar	65.28	29,376.00			
1.6.2.3	45.00	Each	Trucking - Per Load		0.00	0.00	Detail	U.S. Dollar	1,375.00	61,875.00
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
USTRUCKING	Trucking Sub		61,875.00	Each	U.S. Dollar	1.00	61,875.00			
1.6.2.4	1,035.00	Ton	Scrap Credit		0.00	0.00	Detail	U.S. Dollar	(216.00)	(223,560.00)
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
UODCFERROUS	Ferrous Metal Scrap		1,035.00	Ton	U.S. Dollar	(216.00)	(223,560.00)			
1.6.3	45.00	Each	Remove Foundations To Subgrade		58.63	0.77	Detail	U.S. Dollar	2,594.35	116,745.82
Notes: ***** Assumption: 24x36x1 concrete pad per inverter/ transformer *****										
1.6.3.1	4,320.00	Cubic Yard	Excavate / Remove Foundation		15.43	280.00	Detail	U.S. Dollar	15.05	65,020.61
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
L060100	GENERAL LABORER	154.29	1.00	Each (hourly)	U.S. Dollar	38.04	5,868.60			
L010101	OPERATOR	308.57	2.00	Each (hourly)	U.S. Dollar	48.95	15,103.43			
*REXCAV06C	Excav 100K w/ Hammer	154.29	1.00	Each (hourly)	U.S. Dollar	160.97	24,834.60			
*REXCAV06A	Excav 100K w/ Bucket & Grapple	154.29	1.00	Each (hourly)	U.S. Dollar	124.54	19,213.97			
1.6.3.2	4,320.00	Cubic Yard	Concrete Transport Offsite		43.20	100.00	Detail	U.S. Dollar	11.97	51,725.22
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
RDUTRK06	CAT D350D, 18CY-24CY	432.00	1.00	Each (hourly)	U.S. Dollar	74.29	32,093.28			
L080940	TEAMSTER	432.00	1.00	Each (hourly)	U.S. Dollar	45.44	19,631.94			
1.6.4	1.00	Lump Sum	Solar Panel Removal		95.37	0.01	Detail	U.S. Dollar	2,108,864.60	2,108,864.60
1.6.4.1	457,785.00	Each	Solar Panel Removal		95.37	4,800.00	Detail	U.S. Dollar	2.78	1,274,589.60
Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost			
RLIFTS05	JCB 508C, 8,000lbs FRKLFT	5,722.31	6.00	Each (hourly)	U.S. Dollar	21.65	123,859.45			

Cost Item								
CBS Position Code	Quantity UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
L010101	OPERATOR		5,722.31	6.00	Each (hourly)	U.S. Dollar	48.95	280,086.02
L060100	GENERAL LABORER		22,889.25	24.00	Each (hourly)	U.S. Dollar	38.04	870,644.12

Notes: *****
 Assumed production: 20 panels per laborer per hour,
 includes packaging and preparing for shipment offsite.

1.6.4.2	407.00	Each	Trucking - Per Load	0.00	0.00	Detail	U.S. Dollar	1,375.00	559,625.00
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost	
USTRUCKING	Trucking Sub		559,625.00	Each	U.S. Dollar	1.00	559,625.00

Notes: *****
 Assumption: 45,000 lbs per load

1.6.4.3	9,155.00	Ton	Disposal Cost	0.00	0.00	Detail	U.S. Dollar	30.00	274,650.00
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost	
USDISPOSAL	Disposal Fee's		274,650.00	Each	U.S. Dollar	1.00	274,650.00

Notes: *****
 Assumption: 457,758 modules x 40 lbs each

1.6.5	1.00	Lump Sum	Solar Rack (Trackers) & Post Removal	81.75	0.01	Detail	U.S. Dollar	1,481,281.52	1,481,281.52
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1.6.5.1	6,540.00	Each	Solar Rack (Trackers) & Post Removal	81.75	80.00	Detail	U.S. Dollar	242.00	1,582,670.52
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost	
L010101	OPERATOR	6,540.00	8.00	Each (hourly)	U.S. Dollar	48.95	320,108.80
L060100	GENERAL LABORER	6,540.00	8.00	Each (hourly)	U.S. Dollar	38.04	248,763.62
*REXCAV06A	Excav 100K w/ Bucket & Grapple	3,270.00	4.00	Each (hourly)	U.S. Dollar	124.54	407,229.45
*REXCAV06E	Excav 100K w/ Shear	3,270.00	4.00	Each (hourly)	U.S. Dollar	185.50	606,568.65

Notes: *****
 Assumed production: .5 hour per rack per crew. Crew to include
 1 excavator w/shear, 1 excavator w/grapple, 2 operators and 2
 laborers. Includes post removal and sizing of steel for sale as scrap,
 and loadout to haul trucks.

1.6.5.2	29.00	Each	Trucking - Per Load	0.00	0.00	Detail	U.S. Dollar	1,375.00	39,875.00
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost	
USTRUCKING	Trucking Sub		39,875.00	Each	U.S. Dollar	1.00	39,875.00

Notes: *****
 Assumption: 45,000 lbs per load

1.6.5.3	654.00	Ton	Scrap Credit	0.00	0.00	Detail	U.S. Dollar	(216.00)	(141,264.00)
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost	
UODCFERROUS	Ferrous Metal Scrap		654.00	Ton	U.S. Dollar	(216.00)	(141,264.00)

1.7	1.00	Lump Sum	Site Restoration - Partial Site Seeding	191.70	0.01	Detail	U.S. Dollar	525,816.50	525,816.50
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1.7.1	116,160.00	Linear Feet	Decompact Roads	145.20	800.00	Detail	U.S. Dollar	2.68	311,544.90
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost	
*RDOZER08	CAT D6 LGP Dozer	2,904.00	2.00	Each (hourly)	U.S. Dollar	58.34	169,404.84
L010101	OPERATOR	2,904.00	2.00	Each (hourly)	U.S. Dollar	48.95	142,140.06

Notes: *****
 Decompaction to include discing and regrading

1.7.2	186.00	Acre	Spot Grade Disturbed Areas	46.50	4.00	Detail	U.S. Dollar	536.41	99,771.61
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
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Cost Item								
CBS Position Code	Quantity UM	Description	Days	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
*RDOZER08	CAT D6 LGP Dozer	930.00	2.00	Each (hourly)	U.S. Dollar		58.34	54,251.55
L010101	OPERATOR	930.00	2.00	Each (hourly)	U.S. Dollar		48.95	45,520.06

Notes: *****
 Assumption: 1900 acres total property area.
 43 acres of roads, and 1857 acres of remaining area.
 Assume that 10% of the remaining area disturbed by construction will be regraded.

1.7.3	229.00 Acre	Re-Seed With Native Vegetation - Roads & Areas Disturbed By Construction	0.00	0.00	Detail	U.S. Dollar	500.00	114,500.00
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
USLANDSCAPE	Landscape Sub		229.00 Acre	U.S. Dollar	500.00	114,500.00

Notes: *****
 Assumption: 1900 acres total property area.
 43 acres of roads, and 1857 acres of remaining area.
 Assume that 43 acres of road area to be reseeded, and 10% of the remaining area disturbed by construction will be reseeded.
 229 acres total to be reseeded.

1.8	1.00 Lump Sum	Home Office, Project Management (5% Of Cost)	0.00	0.00	Detail	U.S. Dollar	282,619.55	282,619.55
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
USMARKUP5	5% Markup		5,652,391.00 Each	U.S. Dollar	0.05	282,619.55

1.9	1.00 Lump Sum	Contractor Contingency (5% Of Cost)	0.00	0.00	Detail	U.S. Dollar	296,750.60	296,750.60
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
USMARKUP5	5% Markup		5,935,012.00 Each	U.S. Dollar	0.05	296,750.60

1.10	1.00 Lump Sum	Contractor OH & Fee (15% Of Cost)	0.00	0.00	Detail	U.S. Dollar	934,764.15	934,764.15
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Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
USMARKUP	15% Markup		6,231,761.00 Each	U.S. Dollar	0.15	934,764.15

Report Total:			837.72					7,166,525.35
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Category	Total
Labor	3,020,394.34
Rented Equipment	1,806,029.71
Supplies	2,840.00
Materials	40,000.00
Subcontract	2,786,909.30
ODCs	7,800.00
Other Costs	(497,448.00)

Appendix F
Example Emergency Management Plan

Empire Solar Project

Emergency Management Plan

Prepared for:



**Avangrid Renewables, LLC on behalf of Aurora Solar, LLC
1125 NW Couch St, Suite 700
Portland, Oregon 97209**

Prepared by:

**Ecology and Environment, Inc.
333 Southwest Fifth Avenue, Suite 600
Portland, Oregon 97204**

December 2016

Empire Solar Project

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1. INTRODUCTION

1.1 Project Description

Aurora Solar, LLC (Aurora), a wholly owned subsidiary of Avangrid Renewables, LLC, proposes to construct and operate the Empire Solar Project (Project) in Crook County, Oregon. The Project would consist of an up to 56-megawatt (MW) commercial photovoltaic (PV) energy system that would provide electricity to regional consumers. The Project would be located in the far western portion of Crook County, approximately 10 miles southwest of the city of Prineville. Project components include the proposed energy facility site, including solar arrays and electrical support equipment and facilities within a security fence; an approximately 1.9-mile-long, 34.5 kV overhead electricity collector line; a small collector substation (0.5 acres); and a new 1.77-mile-long access road along most of the collector line (referred to collectively as the “Project site”) (see Figure 1). The permanent impacts of the Project site will not exceed 320 acres.

The Project includes the following components:

- At the energy generation facility: PV solar panels using a ground-mounted single-axis tracker or fixed mounting system, selected to maximize power output.
- At the energy generation facility: Electrical equipment, including a direct current (DC) collection system from the PV panels to centralized inverters, and an alternating current (AC) transformer system. Several segments of the AC collection system would be underground with the remainder carried on overhead lines, which would carry electrical output from each array to a riser pole/switchpad (50 feet X 50 feet).
- Security fencing around the generation facility, including around the solar array, electrical equipment, and internal access roads.
- From the switchpad, an approximately 1.9-mile-long, 34.5-kV overhead electricity collector line to a new collector substation.
- Collector substation (125 feet X 175 feet)—located at the northern terminus of the collector line—to step-up the voltage from 34.5-kV to 115-kV, before connecting to an existing shared 115-kV gen-tie line heading north to PacifiCorp’s Ponderosa Substation;
- A laydown area (2.92 acres) and Operations and Maintenance (O&M) building will be sited within the fence line of the energy facility and consist of parking for personnel, storage for tools and parts, office space, communications and facility monitoring hardware/software equipment (CORE).
- Stormwater management facilities designed in accordance with guidance and regulations, to be finalized with final selection of PV technology and layout.

- A 1.77-mile-long, 14-foot-wide access road (partially new, partially existing), able to support 60,000 lbs, with pull-outs (10 feet X 30 feet) every 0.25 miles (6 total), primarily running parallel to the collector line.

Project construction is expected to begin in December 2017 and is expected to take six to nine months to complete. The in-service target for the Project is December 2018. Aurora expects the Project to operate for approximately 40 years before being decommissioned.

Project Location, Geography, and Climate

The solar generation facility will occupy approximately 317.2 acres within a 490-acre parcel leased by Aurora. A 34.5-kV aboveground electricity collector line would extend north and east for approximately 1.9 miles within a 200-foot-wide easement corridor before interconnecting with an existing shared gen-tie line via a new collector substation. From the collector substation, the shared gen-tie line would extend 2.65 miles north to PacifiCorp's Ponderosa Substation. The collector line would consist of approximately 32 wooden poles and installation would require 12-foot diameter temporary work areas at each pole.

The Project will be located entirely on private land that is utilized for cattle grazing and hunting, and supports two habitat types: sagebrush steppe and western juniper woodland. The site is located on relatively flat terrain.

The Project site is east of the Cascade Range, within the Central Oregon high desert. In Crook County, the Cascade Range contributes to high wildfire rates of spread due to gusty, dry cold fronts that frequent the area (Geiger 2014). The Cascade Range also creates a rain shadow, resulting in precipitation averages of 8 to 10 inches annually in the vicinity of the Project. Due to the location and climate, accidental fires are a cause for concern during the construction, operation, and decommissioning phases of the Project.

The Project site is located within the Powell Butte Risk Assessment Area, which is in the jurisdiction of the Crook County Fire & Rescue. The Crook County Fire & Rescue responds to structural and natural vegetation fires in Crook County Rural Fire Protection District No. 1.

1.2. Plan Purpose and Goals

The purpose of this Emergency Management Plan (EMP) is to satisfy the Crook County Zoning Code for Commercial Energy Facilities (Commercial Energy Generating Facilities: Chapter 18.131) and the Crook County Conditional Use Permit. This EMP is designed to also address concerns in the Crook County Emergency Management Plan (CCEM 2012). The goal of this EMP is to provide safety guidelines and procedures for potential emergency-related incidents during all phases of the life of the facility (construction, operation, and decommissioning). This EMP covers emergency communications and training (Section 2), theft and vandalism (Section 3), high voltage equipment (Section 4), and fire safety and prevention (Section 5).

There are four general phases of Aurora's Health and Safety Plans and Emergency Action Plans:

1. Pre-mobilization
2. Active construction
3. Transition from construction to operations
4. Plant operations

The scope and contents of the plans vary by their intended use, the personnel and equipment that are on site at the time, and the scope of work. Construction is a fluid operation as there are many smaller projects that are completed in sequence before the plant operates as a whole. Normal plant operations are relatively stable and even the emergency scenarios can be well planned. This document describes how Aurora will implement a safe worksite while planning for emergency contingencies.

Pre-mobilization: In general, before mobilization the plans are specific for the task(s) and person or crew that is performing work at or near the site. Medical facilities and local emergency services are identified with contact information. A risk analysis is performed and appropriate Personal Protective Equipment and mitigation measures are identified and planned for. The document used for this is a Job Hazard Analysis (JHA) and is typically a form with one or two pages.

Active Construction Operations: Prior to the mobilization of construction operations, a site-specific Health and Safety Plan is developed by the General Contractor and reviewed by Aurora that meets the requirements of 29 Code of Federal Regulations (CFR) 1926.20. This document is typically 10 to 30 pages long and lists the various

major tasks and risks of the construction process. Identified risks are then mitigated through engineering controls, training, equipment (including personal protective equipment), and procedures. This document references many sections of 29 CFR 1926—the labor regulations regarding construction safety activities—and also complies with state regulations as they are more restrictive than the federal regulations.

Aurora has health and safety standards in its contract documents. These standards will be identified to the contractor before the bidding process so that the cost of these provisions may be included in the cost of the project.

Also prior to General Contractor mobilization, a site Emergency Action Plan (EAP) is developed to meet the requirements of 29 CFR 1926.35. Additionally, emergency actions in the case of a fire are fully developed including reporting, incipient firefighting, and evacuation in accordance with 29 CFR 1926.24.

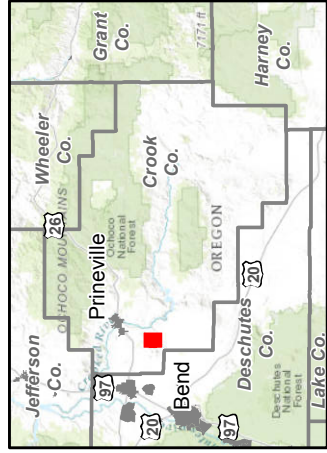
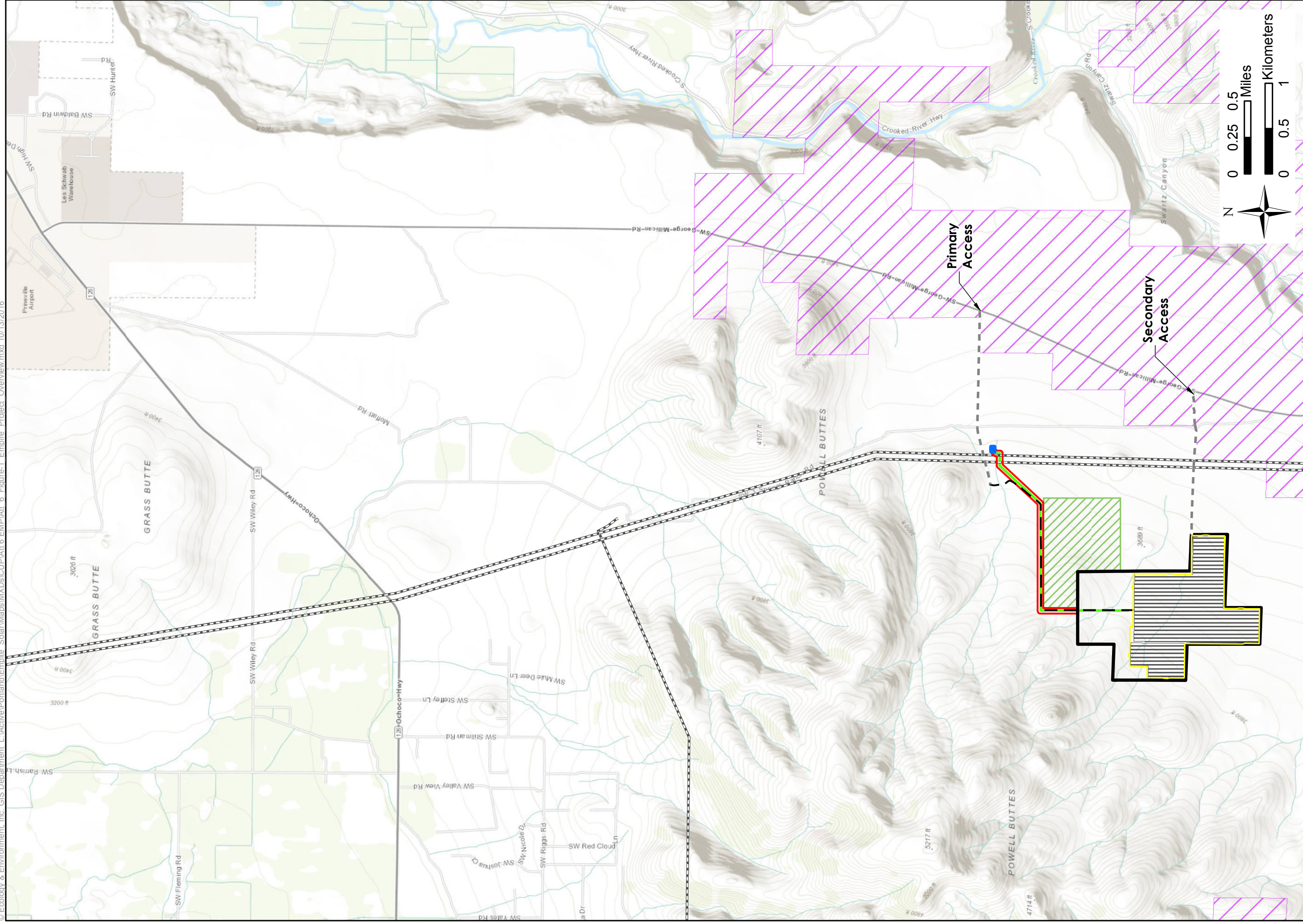
Aurora will request review of the EAP from the local fire department. Other sections deal with storms, seismic events (if applicable), major injuries, security events, and similar plausible situations. Any specific equipment is also identified—for example, snow-cats for extreme winter weather. Specific landing zones for helicopter extraction are identified and their coordinates communicated to the owner of the aircraft for quick reference. Finally, pre-staged first aid kits, backboards, and other medical supplies are identified if the site is large enough to make that provision applicable.

During construction activities, at least one drill is staged to verify that the plan is successful and that all personnel who have responsibilities understand and can execute them. With some projects, there is sufficient personnel turnover that a second drill is held. For wind farms, a drill is held during heavy civil work while the roads and crane pads are being constructed and then another one near the start of erection activities. Solar and bio-mass plants typically only require one drill, although additional drills may be called for by the site personnel or local community. One of the main goals of the drill is to familiarize the local first responders with the new layout and enable them to find their way to an “injured” person or to fight a fire at a particular location at the site.

Transition from Construction to Operations: Toward the end of construction activities, the number of personnel on the site drops and the major roles under the ICS shift to permanent site operational personnel. This transition is facilitated by staffing the site with operational personnel during the construction process and introducing them to

the local emergency response personnel during construction. Typically, they are on site during one of the drills and have familiarity with local first responders at that time. An O&M EAP is developed during this time from the information and resources used during the construction process. At various points of the transition process, there will be deliberate shifts of responsibility from the General Contractor to O&M personnel. To avoid gaps and overlaps, this is both gradual and deliberate. Communication with local first responders occurs during these shifts.

Plant Operations: The final stage is when Aurora O&M personnel are fully staffed and have control of the site. They have their own extensive Health and Safety protocol that is integrated into the normal work routine. This also includes the JHA process as they have regular and routine tasks to perform on the various pieces of equipment on the site. An Emergency Action Plan is also developed, implemented, and trained. Site personnel must hold at least two drills of this plan per year. If possible, local first responders will be asked to participate. There are more details later in this document.



- Figure 1**
Project Overview Map
- Empire Solar Project**
- Unpaved Road
 - Proposed Access Road
 - PacifiCorp 500kV Transmission Line
 - Collector Substation
 - Leased Area
 - Collector Line Easement
 - Collector Line
 - Solar Generation Facility
 - Generation Facility Fence Line
 - BLM
 - State of Oregon Land

Source: USGS Earthstar Geographics SIO, 2015; Microsoft Corporation, 2010

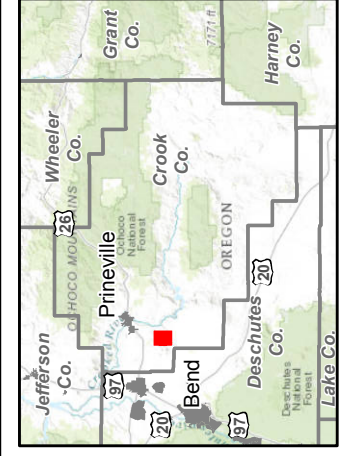
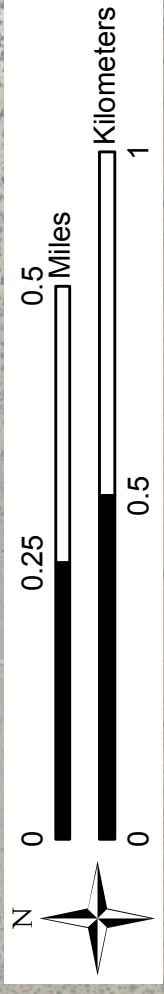
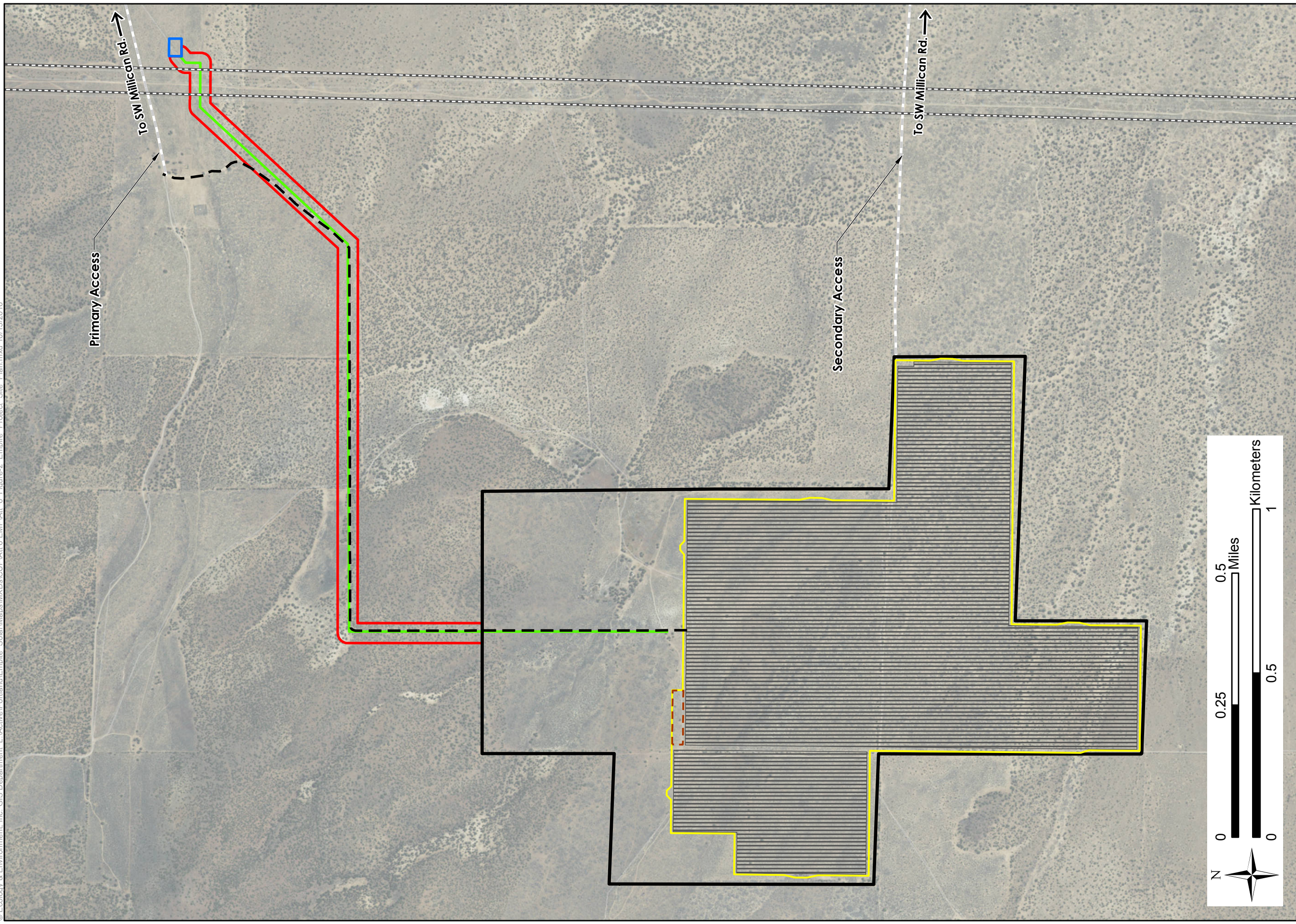


Figure 2
Project Site
Empire Solar Project
Crook County, OR

	Proposed Access Road		Collector Line
	Unpaved Road		Solar Array
	PacificCorp 500kV Transmission Line		Generation Facility Fence Line
	Collector Substation		Laydown Area with O&M Building
	Leased Area		
	Collector Line Easement		

Source: USGS Earthstar Geographics SIO, 2015; Microsoft Corporation, 2010

2. EMERGENCY COMMUNICATIONS AND TRAINING

2.1 External Communication

In the event of any situation involving a medical, natural, or security emergency, Project staff and/or subcontractors will **call 911** and inform local first responders of any material event or situation. First responders will evaluate the situation and help facilitate the correct courses of action.

In the event that local first responders, other local or state personnel, or members of the public need to contact Aurora/Avangrid to report emergency situations, the following emergency contact number should be called:

- National Control Center in Portland, Oregon: 1-866-351-5657

2.2 Internal Communication

After contacting 911 and reporting the emergency(s), Project staff and/or subcontractors will also contact their direct supervisors and the Project manager and apprise them of the situation. The Project manager will initiate a suitable response within the company. Aurora has established standing orders and protocols for each type of emergency situation that is reported.

2.3 Emergency Training

Staff Training

This EMP has been developed to identify what actions need to be taken in the event of an emergency during construction and operation of the Project, as well as the party responsible for implementing the plan. The Project owner shall designate a person to be the emergency prevention *program* manager, who shall ensure that the emergency prevention program is carried out through completion of the Project. At all times during construction, at least one Project employee with first aid certification will be on site to respond to emergencies. Additionally, all construction and operations staff working on the site will be required to attend a Project Safety Training. This training will emphasize the emergency response procedures during Project construction and operations and will include, at a minimum:

- Training of responsible personnel in the use of first aid equipment;
- Fire protection measures;
- Hazardous substance spill prevention and containment measures; and

- Penalties for violation.

3. TRANSPORT TO NEAREST HOSPITAL

If not using ambulance, injured personnel would be driven to St. Charles Medical Center - Prineville, approximately 14 miles and 20 minutes from the Project generation facility site. If the situation requires transport by local Emergency Medical Services, trained staff would provide first aid while waiting for responding units to arrive. The hospital address and phone number is:

St. Charles Medical Center - Prineville
384 SE Combs Flat Road
Prineville, OR 97754
Phone: 541-447-6254

Directions from Project site:

- Drive northeast 3.0 miles to SW Millican Road
- Turn left (north) onto SW Millican Road and travel 6.5 miles
- Turn right (northwest) on Oregon Route 126, continue for 2.6 miles
- Follow road to right onto US Route 26/NW 3rd Street
- Continue 1.6 miles on NW/NE Main Street to NE Combs Flat Road
- Turn right onto NE Combs Flat Road and continue for 0.3 miles, the hospital will be on the left.

4. THEFT AND VANDALISM

4.1 Limited Access

Using the designated primary access route, the Project is an approximately 3-mile drive west and southwest from SW Millican Road, the nearest paved county road, and will be accessed via a combination of existing and proposed unpaved roads on private lands (see Figure 1). This route heads west from SW Millican Road at a point approximately 6.5 miles south of where SW Millican Road intersects with Oregon Route 126. This route is gated (not locked) 0.3 miles west of SW Millican Road.

Secondary access would be via a gated, privately owned gravel road that extends west from SW Millican Road approximately 1.56 miles south of the primary access point and 8.1 miles south of where SW Millican Road intersects Oregon Route 126. This gravel

road extends west for 1 mile before meeting the eastern border of the proposed Project site. This locked gate would be equipped with a secure key storage box to allow access by local emergency responders.

This limited access to the Project will minimize potential trespassing. The nearest paved road, SW Millican Road, is separated from the Project by at least 0.9 miles, depending one's location on the road. Both access routes to the Project will be gated. Public view of the Project would be mostly blocked from SW Millican Road by mature juniper woodland (trees up to 35 feet tall). This lack of visibility to the public will serve to minimize public knowledge of the site and potential theft and/or vandalism by trespassers.

The substation and control system areas will be protected by fences sufficient for security that incorporate wildlife-safe designs as well as security alarms.

4.2 Theft Deterrents

The Project will be secured in the interest of discouraging incidents of theft and vandalism. Solar panels will be bolted in place and will not be easy to transport if removed. The final design of the site and the equipment will determine the exact design of the theft deterrent systems. Lighting will be needed for security and occasional after-hours work. Lighting will include motion-detector-activated lighting at the substation and at the property line, a porch light on the O&M building, and manually energized floodlights around the Project site for occasional after-hours work. In the event of a security emergency, Project staff and/or subcontractors will call 911 and follow the emergency contact protocol described in Section 2.

5. HIGH VOLTAGE EQUIPMENT

The Project would have electrical collection conductor systems below the solar arrays. Multiple alternating current inverter stations would collect the electricity and transfer it to the collector substation. This collector system could pose an electric shock hazard if tampered with by the public.

The collector substation will have an 8-foot-tall chain-link fence of wildlife-safe design (e.g., not topped with barbed wire) surrounding it and a locked gate to deter trespassing and vandalism. Signs that meet National Electrical Code requirements will be posted.

The 34.5-kV collector lines in the generating facility will be installed underground from the inverters/transformer blocks to a central point (switchpad) where the underground lines will emerge onto a central riser pole. From here the 34.5-kV line(s) will be installed overhead on wooden mono-poles approximately 1.9 miles north and east to the project's collector substation, where the electricity will be transformed from 34.5-kV to 115-kV before connecting to an existing shared 115-kV gen-tie line 2.65 miles north to PacifiCorp's Ponderosa Substation. This electrical transmission system will employ standard industry protection measures.

In the event of a natural disaster, induced electrical grid event, or other problem at the Project site, an automated protection scheme will disconnect the generation system from the distribution system at the collector substation. The performance of the power generation site, as well as the substation, is continuously monitored and reported to the National Control Center in Portland, Oregon. The protection relays contain software that manages the various protection and output circuitry to ensure the smooth and compliant transmission of power onto the transmission grid. Should an anomaly occur that is outside of the parameters, the substation and the generation plant will automatically go into safe-mode and will immediately notify the National Control Center for analysis and resolution. The National Control Center operators also have a continual stream of information and can intervene should an appropriate situation arise that does not automatically trip the protection circuitry.

6. FIRE SAFETY AND PREVENTION

Wildfires in Crook County generally are caused by lightning or human activity, with lightning accounting for three times as many fires (Geiger 2014). Typically started by accident, human-caused fires are frequently caused by out-of-control brush burning at residences, fireworks, inadequately suppressed campfires, cigarette butts, and heated catalytic converters in dry grass.

At the solar generation station, Aurora will control many potential ignitions of human origin that cause wildfires. To minimize accidental fire ignition at the Project site, Aurora and its contractors will develop, implement, and maintain strict standard practices as an integral part of daily activities in compliance with National Fire Protection Association (NFPA) 10, NFPA 30, NFPA 70E, 29 CFR 1926, 29 CFR 1926 Subpart F (and the state of Oregon equivalent regulations), and 29 CFR 1910 Subpart E (and the state of Oregon-equivalent regulations). General safety practices include the following:

- Combustible and flammable waste must not be allowed to accumulate in any work area.
- Flammable and combustible materials must not be stacked or stored against any temporary or permanent building, structure, or storage facility.
- Rags and fabric contaminated with natural oils, biodiesel, or other hydrocarbon products must be contained in a closed metal container and removed daily from the workplace to a safe disposal area.
- The contractor will have an appropriate number of portable fire extinguishers on-site during construction, operations, and decommissioning. In addition, the contractor will have a fire suppression water tank onsite during construction and decommissioning.
- During periods when the risk of wildfire is high, activities with inherent fire risks such as hot work (grinding, cutting, welding), chainsaw/chipping operations, etc. be limited.
- During periods when the risk of fire is high, activities with inherent fire risks such as hot work (grinding, cutting, welding), chainsaw/chipping operations, etc. will be limited.
- In the collector line corridor and particularly around related infrastructure (i.e., poles), vegetation will be maintained pursuant to the North American Electric Reliability Corporation and National Electric Code regulations.
- Smoking will be strictly prohibited and permitted only in specific areas of fire safety. These areas will be clearly identified.

6.1 Fire Emergencies

All fires, regardless of the size and/or circumstance(s), shall be immediately reported using the 911 system. Employees and subcontractors shall be trained in proper reporting procedures such as the nature of the emergency, the exact location, a contact person/callback number, and any other important information. The O&M building will have an UL-approved alarm system reporting to a UL-listed central monitoring station¹.

The nearest fire station to the Project is the Crook County Fire & Rescue Station located at 500 Northeast Belknap Street, Prineville, Oregon. The station is located approximately 13 miles (20 minutes) by car from the Project site. In addition, Crook County Fire & Rescue has another station in the community of Powell Butte at 8900 Southwest Reif Road, Powell Butte, Oregon. The Powell Butte substation is 20 miles (approximately 28 minutes) away by car.

¹ UL is an independent safety science company.

6.2 During Construction and Decommissioning

6.2.1 Training

Fire prevention and fire precautions training will be given to all employees and contractors at the Project site. This training will be conducted as part of Aurora's Site Safety Rule and Regulations and is required for all employees before beginning work at the Project site. The training program will include:

- Hazard recognition and risk potential;
- Inspection methods;
- Hot Work Permit requirements;
- Emergency fire procedures;
- Selection and use of portable fire extinguishers; and
- Storage and handling of flammable and combustible liquids brought onto the site.

6.2.2 Material Storage

Materials in work areas will be limited to actual needs and will be stored in a manner to protect combustible material from ignition sources. Storage areas will be kept clean, and materials will be neatly stacked or placed. Construction materials will be stored or placed in an orderly manner. Storage quantities will be minimized.

6.2.3 Compressed Gas Cylinders

Compressed gas cylinders will be handled in accordance with industry best practices and 29 CFR 1926.350 and 352.

Compressed gas cylinder valves will be closed whenever:

- Work is finished;
- The cylinders are empty; or
- The cylinders are moved.

Cylinders will be stored in well-protected, ventilated, dry locations, at least 20 feet (6.1 meters) from highly combustible materials.

Welding gases will be stored in isolated areas and segregated by type of gas.

Compressed gas cylinders will be secured in an upright position at all times, except for short periods when being carried or hoisted.

Cylinders will be transported in an upright position and will not be hauled in equipment beds or truck beds on their side. Cylinders lifted from one elevation to another will be lifted only in racks or containers designed for that purpose.

Compressed gas cylinders will not be hoisted by the valve cap or by means of magnets or slings.

Compressed gas cylinders will not be used as, or placed where they may become part of, an electrical circuit.

Oxygen cylinders will be kept free of oil and grease.

6.2.4 Flammable and Combustible Liquids

The storage of flammable and combustible liquids will be in accordance with NFPA 30 and the Spill Prevention Containment Countermeasures Plan (developed for Operations for all Aurora facilities, where applicable) (triggered by storage of 1,320 gallons or more, which is not the case for this facility). While no combustible liquids, including oil or grease, are intended for use by the facility, any such products will be stored in containers or storage tanks labeled with contents and tank capacity. The transformer might be designed to use mineral oil, albeit permanently sealed. Any container or tank for storage will meet criteria such as:

- Steel Tank Institute F911 and UL 142 standards;
- Capable of withstanding working pressures and stresses compatible with the type of liquid stored;
- Maintained in a manner that prevents leakage;
- Located in an area free of other types of combustible materials; and
- Vented or otherwise constructed to prevent development of pressures or vacuum as a result of filling, emptying or changes in atmospheric temperature in accordance with NFPA 30.

Flammable/combustible solvents will not be used near ignition sources.

Flammable liquids will be handled and used only in approved, properly labeled safety cans.

No equipment will be fueled while the engine is running.

The use of cellular phones or other types of radio-frequency generating devices (pagers, two-way radios, etc.) shall not be permitted within 25 feet during any fueling operations.

6.2.5 Hot Work

All hot work will be conducted under a Hot Work Permit. This permit contains a checklist to promote fire and worker safety. Inspection items include the work and surrounding area, weather and fire conditions, firefighting resources, emergency egress, work coordination, equipment and tool inspections, and fire watch provisions and duration. A permanent hot work site may be developed in a fire-safe area for the construction process. This area will have a daily hot work permit and daily inspection process.

Before hot work can be carried out in any construction area, welding fabrication area, or shop, the area must be cleared of all combustible and flammable material.

All employees will use proper personal protective equipment and clothing when performing or assisting in cutting and welding operations (burning glasses, shields, moleskin suits or flame resistant coveralls and gloves, etc.).

At least two fire extinguishers with a 15-pound Class A, B, C rating will be at the work location during welding, cutting, soldering, etc. They will be placed in the most likely area of egress should a fire occur.

Welding leads and equipment will be properly maintained and inspected before use. Defective equipment will not be used and will be reported to the supervisor.

A fire-resistant container will be provided for spent electrode stubs.

Welding machines will be turned off when being moved or when the welder must leave his/her work for any length of time.

Hoses and torches will be inspected before use, and defective hoses will be removed from service.

Torches will be ignited by friction lighters or other approved devices only.

Cylinders, all hose apparatus, and connectors will be kept free of oil and grease and not handled with oily or greasy hands or gloves.

Oxygen/fuel gas systems will be equipped with approved back-flow valves, flash back arresters, and pressure relief devices.

Fuel gas/oxygen equipment will be disconnected from the source when left unattended (e.g., lunch breaks, work interruptions, completion of the task), and torches will not be left unattended inside a confined space.

The frame of all arc welding or cutting machines will be effectively grounded when the machine's power outlets are being used as an electrical power source.

If electrode holders are to be left unattended, the electrodes will be removed and the holder placed where it is protected from unintentional contact.

Fire watchers will be trained and will remain at the location for 30 minutes during normal fire risk and 60 minutes during periods of very high fire risk as defined by the National Weather Service for the site area.

Hot work at height and from scaffolding presents special hazards. The controls are as follows:

- All work must be coordinated with other subcontractors working in the area.
- Areas beneath hot work must be cleared of all combustible and flammable materials.
- Fire-retardant material must be used to cover scaffold boards and to enclose operations.
- Fire-retardant material must be removed at the end of every shift to expose scaffold boards or combustible materials.

6.2.6 Electrical Equipment

Task lighting, particularly halogen lamps, must be clear of combustible materials when in use. The use of cool lights for individual task lighting is encouraged.

Only approved connectors may be used on electric arc welding leads.

Flexible cables, tools, and equipment, including welding equipment, must be inspected regularly for damage. Monthly inspections must be documented.

6.2.7 Fire Protection Equipment

Fire extinguishers will be inspected, tested, and maintained in accordance with applicable codes/standards such as NFPA standards or State of Oregon equivalent.

Fire extinguishers will be conspicuously marked, and clear access to each will be maintained. Employees will be trained in the use of fire extinguishers.

Each fire extinguisher will be replaced immediately after discharge with another fire extinguisher that is fully charged and of the proper size and type.

Fire extinguishers will be provided and maintained at the following locations:

- On all motorized vehicles;
- At any fuel dispensing or service area; and
- At storage areas for flammable or combustible liquids.

Smoking will be permitted only in designated areas.

Electrical wiring and equipment for light, heat, or power purposes will be installed in compliance with local building codes or 29 CFR 1926 Subpart K if for temporary use during construction activities.

6.2.8 Inspection and Testing

General and specific inspection schedules will be developed and implemented.

General inspections will be conducted monthly and will include all construction areas, storage and lay down areas, and fabrication and painting areas.

6.3 During Operations

6.3.1 Flammable and Combustible Liquids

Bulk flammable and combustible liquids will be stored in STI F911 and UL 142 containers in accordance with NFPA 30 and local building codes.

Non-bulk storage will be in accordance with local building codes in Department of Transportation approved packaging and on secondary containment, if appropriate. Smaller quantities of flammables shall be stored inside of a flammable materials locker.

Local Emergency Planning Commission standards will be complied with. Direct contact and communication of normally stored flammable materials will be made with the local fire department.

Flammable/combustible solvents will not be used near ignition sources.

No equipment will be fueled while the engine is running.

The use of cellular phones or other types of RF-generating devices (pagers, two-way radios, etc.) shall not be permitted within 25-feet during any fueling operations.

Permanent dispensing units will be protected against collision damage.

6.3.2 Electrical Equipment

Task lighting, particularly halogen lamps, must be clear of combustible materials when in use.

6.3.3 Fire Protection Equipment

Fire extinguishers will be inspected, tested, and maintained in accordance with applicable local codes/standards and NFPA 10.

Employees will be trained in the use of fire extinguishers.

Each fire extinguisher will be replaced immediately after discharge with another fire extinguisher that is fully charged and of the proper size and type.

Fire extinguishers will be provided and maintained at the following locations:

- On all motorized vehicles;
- At the fuel area, if applicable; and
- At storage areas for flammable or combustible liquids.

Smoking will be permitted only in designated areas. Smoking will be prohibited at or in the vicinity of operations that constitute a fire hazard. A sign reading “No Smoking or Open Flame” will be conspicuously posted.

7. FREQUENTLY ASKED QUESTIONS

Avangrid Renewables, LLC, Aurora’s sole owner, is the largest operator of renewable energy plants and has developed a systemic procedure and approach to worker and community safety at its plants. We have a very good safety record because of this approach and the quality of the personnel that we have on staff. We share lessons-learned from each hazardous condition discovered, each near miss, and each injury that occurs on our sites and even on other company’s sites as we get the information. We continuously improve our performance as new techniques, procedures, equipment, and tools become available. We also innovate ourselves and have a program for rewarding and acknowledging personnel who bring new and safer means and methods of performing the work and operating the plants on an ongoing basis. This experience has led us to memorialize the following frequently asked questions regarding our program that will be put into place at proposed solar facility:

Question: How do you start a project so that everyone knows about the safety and emergency procedures?

Answer: A project kick-off meeting is held where this information is covered. Local emergency planning officials are welcome to attend the non-contractual parts of the meeting. The agenda is:

- Introduction of the various entities
- Site safety
- Emergency planning
- The scope of the work
- Quality assurance/quality control (QA/QC)
- Environmental / Permitting
- Expected reports and documentation
- Communications
- Schedule
- End of project expectations

Question: How do we fight a transformer fire?

Answer: If a transformer fire occurs, firefighting activities are limited to controlling the spread of the fire. The value of the equipment is minimal compared to the life of a firefighter. Additionally, if the fire is electrical in nature, using water on it may be dangerous. Aurora personnel will ensure that the supply of electrical current is shut off before anyone will approach burning electrical equipment. Most often, the plan will be to let it burn itself out if the fire can be contained from spreading.

Question: How are fires detected?

Answer: The solar arrays, substations, and large pieces of electrical equipment are equipped with sensors and protection gear that fails into a “safe-mode.” To detect fires, smoke detectors of various types, arc-flash detectors, rate of rise detectors, thermometers, and many other types of sensors continuously monitor the equipment. Should an anomaly occur, there are automatic shut downs that place the equipment into safe-mode. Some of these systems are redundant and do not require outside electrical power to operate – they may be spring loaded or charged with compressed gas. These

sensors are monitored by the internal software of the various computerized systems and at the National Control Center in Portland, OR. A backup control center is in Arizona. Any asset that is not performing within the safe parameters can be manually shut down – even if the automatic system has not activated, yet. In the O&M Building, a UL compliant fire detection system is actively monitored by a UL listed central monitoring station.

Question: Can we have a copy of the O&M HASP and EAP?

Answer: As many of the elements of the HASP and EAP are integrated into several operating documents – specifically personnel training records - it is not appropriate to provide a complete copy of the plan for access by the general public. We will provide a Table of Contents or the Emergency Plan for the record. Emergency response personnel can have full access to the plan on site and will be provided training on the plan along with the documentation and resources they need for a proper and safe emergency response. We fully comply with Local Emergency Planning Commission reporting and encourage regular inspections and visits by officials that have a need to know so that if an emergency occurs they have good familiarity with the site, the personnel, and the equipment.

Question: Can we get maps?

Answer: Yes, maps will be provided along with site and headquarters contact information. This is typically provided before mobilization and will be updated as the phases and personnel change from construction to operations control.

Question: How do emergency responders get access to the various buildings and equipment? Can we get keys?

Answer: The O&M building is like any other building – we typically incorporate a Knox Box for fire department access. There is one limited access room inside the building where the SCADA system equipment is. This room normally is a National Electrical Reliability Commission restricted area and is a 6-sided concrete vault.

The substation switchgear building is a high voltage area and firefighting will not occur inside of that building. Before any firefighter could enter, the power to the building would have to be eliminated and that will require the cooperation of the transmission grid

operator. The building does not contain flammable materials, but does contain the switches to control power that feeds into and out of the main transformer. Like any other similar building, access is restricted to specific, trained personnel.

If equipped, an electrically operated gate for the fenced compound can be controlled by the Security Operations Center in Portland, OR. The post is staffed 24/7 and can open the gate for any official need for access.

Question: What is on the JHA?

Answer: The JHA forms vary from contractor to contractor. We specify the following elements to be on the JHA in some manner that the crews will actually use:

- Task step description.
- Potential hazards.
- Hazard mitigation.
- The materials necessary to complete the task.
- The tools, equipment, and calibration necessary to complete the task.
- The training or qualifications necessary to complete the task.
- The Personal Protective Equipment (PPE) necessary to complete the task.
- Roles and responsibilities.
- Communications between workers - and visitors.
 - Evacuation area and assembly area.
 - Permits and permit checklists.
 - The end goal – what the finished product looks like.
 - QA/QC documentation.
 - Foreman certification of safe work completed in accordance with the QA/QC program.

Question: What is the contractual specification for the EAP during construction?

Answer: The Emergency Action Plan must be written in accordance with the local weather conditions, with weather warning systems implemented that can adequately warn site personnel in time to safely evacuate. Areas with tornado activity, must account for potential tornados. Areas where hurricanes or tropical storms may strike must have a hurricane plan in place to safeguard site equipment and personnel and

account for mass evacuation, flooding, and extended periods without site access or utility services. All personnel on site must be able to be accounted for after all significant weather events.

The emergency action plan will be drilled in conjunction with all organizations on the site. The local emergency response organizations, specifically the fire department and injured person transport, shall be notified and invited to participate. Appropriate helicopter landing zones shall be identified and prepared prior to this drill.

Lightning warning procedures shall be implemented for the site. Lightning strikes followed by the sound of thunder less than 30 seconds later will be cause for an immediate work shut down. Project personnel will seek shelter in a building or vehicle. Work may resume once 30-minutes has passed after the last lightning strike.

Tornado shelters or evacuation areas shall be designated before site mobilization. Tornado shelters must be able to accommodate the number of workers expected to be on a site. These shelters may be off-site and in the local community (schools, hotels, rest areas, etc.). Crews may designate local features, such as depressions and ditches for immediate action.

All personnel must have training in the weather emergency action plan. At minimum, all personnel shall be able to identify the rally point(s), warning signals, and shelter areas.

Question: What is the Table on Contents of the Operations and Maintenance Emergency Plan?

Answer: EMERGENCIES & HAZARDOUS CONDITIONS

- Fire
- Lightning, Thunderstorms & Tornadoes
- Earthquake
- Flooding
- Extreme Heat
- Snow & Winter Weather
- Icing on External Equipment
- Chemical Spill
- Notifications

- Bomb Threat
- Other Emergencies

Question: What happens during emergency grid operations that involve the transmission grid?

Answer: The generating plant will be controlled and regulated by the National Control Center (NCC) of Aurora in Portland, Oregon. The NCC will provide oversight and control of the plant on a round-the-clock basis – even if it is not actively generating power, ensuring its readiness for production and grid support. As a power generation facility, we follow all directives from the Control Area Operator. During periods of shortage or system stress, the grid operator broadcasts to generators any warnings or restrictions, which we execute and adhere to. We have continuous monitoring of the grid operator's warning system. The NCC operates and dispatches all generating assets within area. The NCC follows all emergency procedure protocols, both internal and with the grid operator. As a solar plant, system/grid emergencies would be directed to the NCC, and resulting instructions would be executed. For other emergencies, non-grid related, we adhere to our EHS Manual. Communication from the grid operator is via electronic and voice channels, from control room to control room. The National Control Center is the primary contact for the Control Area Operator and acts on behalf of all generating assets within the company. We follow all dispatch orders from the grid operator, to include transmission limitations, curtailments, outages, etc. Such notifications and limitations are executed via the NCC in direct communication with the grid operator.

Question: Are operating plant personnel trained and competent for both normal work and emergency situations?

Answer: All personnel on-duty are trained, qualified, and capable of performing their job functions. Personnel are assigned only to duties for which they are properly trained and qualified. Aurora requires all personnel to be trained and qualified according to each employee's specific job requirement within prescribed stages as set forth in the EHS and Training Manual. There are several qualifications that may be obtained or are required by Aurora Technicians: Basic Operations Department Qualification (BODQ), Solar Theory, Solar Practices (as plant equipment appropriate), Qualified Electrical Worker (QEW) and Breaker/Switch Operations (Switching).

Aurora has a well-defined systematic approach to the training that is needed by each employee defined by their plant and duties as Operations Personnel Knowledge and Skill. The training program is managed by the Aurora Training Department under the Field Services Environmental Health and Safety (EHS) Department. All training on plant is managed and implemented by the plant manager via his or her plant EHS Coordinator and plant Training Coordinator. The plant EHS Coordinator and Training Coordinators are both specifically trained for their roles by their corresponding managers within the Field Services EHS Department. Further, they have monthly meetings to review updated training and provide further information for each plant.

In addition to the skill-based training described above in Operations Personnel Knowledge and Skill, further annual training takes place for Environmental Health and Safety (EHS), OSHA, and NERC regulatory topics. The periodicity of these topics is based on the EHS Training Matrix, which is revised annually or more frequently as changes require. Topics that are updated throughout the year require immediate retraining for all plant personnel. Any contractors and visitors to the plant are taken through a mandatory site safety orientation, which varies in depth and content depending on the task they are on the plant to accomplish. All personnel must be trained, with documented tests or demonstrations of knowledge prior to earning access to the plant and plant equipment. All training documents (to include muster sheets and tests/documented demonstrations of knowledge) are retained in hard copy for the life of the plant and are entered online.

Aurora maintains initial, annual, and periodic training requirements for managers, administrative personnel, and technicians assigned to power generation facilities. These annual training requirements include a complete review, to include test of knowledge, of the Aurora Environmental Health and Safety (EHS) manual. In addition to the annual emergency response plan training requirements, Aurora requires each power generation facility to conduct two drills: a “table top” or simulated action drill, and one complete live-action drill with the assistance and participation of an outside emergency agency, such as the fire department, ambulance service, or police. Aurora has created and maintains a list of recommended personal protective equipment (PPE) and provides direction on the use of proper PPE through the annual training requirements of EHS manual. The annual required training, to include emergency response and CPR/first aid, for all Aurora power generation facilities is updated regularly and can be found in the document EHS Training Matrix.

Personnel take immediate actions to prevent or correct unsafe situations.

Aurora's Stop Work Policy

All employees have the right and obligation to stop work at any time in the event of emergency or unsafe conditions. Only after such time that the condition giving rise to the stop work is ameliorated, will work resume.

8. REFERENCES

Crook County Emergency Management (CCEM). 2012. Prineville and Crook County Emergency Operations Plan 2012 Update. December 15, 2012.

Geiger, Tami. 2014. Crook County Community Wildfire Protection Plan. Crook County Administration and Central Oregon Intergovernmental Council. June 2014. <https://www.coic2.org/crook-county-cwpp/> Accessed December 16, 2014.