Final Environmental Impact Statement

Horse Heaven Wind Farm

Chapter 4 - Analysis of Potential Impacts and Mitigation

October 2023

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4.0 CHAPTER 4 – ANALYSIS OF POTENTIAL IMPACTS AND MITIGATION

4.1 Introduction

This chapter presents the analysis of environmental impacts of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) concerning the elements of the environment identified in Chapter 3 and identifies any required measures for mitigating those impacts.

Three stages would occur if the Project were authorized:

- Construction (including pre-construction)
- Operation
- Decommissioning

Components of the Proposed Action include one of two proposed turbine options (Turbine Option 1 or Turbine Option 2), up to three solar arrays, up to four substations, up to two battery energy storage systems (BESS),[1] and supporting infrastructure (roads, collector lines, transmission lines, etc.). The final number of turbines (no more than 244) and solar arrays would depend on the turbine models and solar modules selected and the final array layout.

Impacts are analyzed for each component during each of the three Project stages. The analysis is largely based on information provided in the Project's Application for Site Certification (ASC). Potential impacts related to the Project's components are generalized for the analysis of the Proposed Action when impacts are common within the Wind Energy Micrositing Corridor or Solar Siting Areas. The analysis of impacts is based on the laws and regulations current at the moment in time the ASC was submitted to the Washington Energy Facility Site Evaluation Council (EFSEC). Laws and regulations may be different at the time of decommissioning, and there is no way to anticipate if or how laws and regulations may change. EFSEC may request that additional studies be completed as a form of mitigation prior to decommissioning of the Project.

The Project may be built using a "phased approach," with distinct, fully functional portions of the Project potentially being built and implemented sequentially. Table 2-6 provides Horse Heaven Wind Farm, LLC's (Applicant's) example of a phased construction approach that is considered in the analysis of air, transportation, and socioeconomics in Chapters 3 and 4. For all other elements of the environment analyzed in this Environmental Impact Statement (EIS), the Project as a whole (reflecting the potential for all components to be built irrespective of the Applicant's phased construction approach) was analyzed.

4.1.1 Impacts

This chapter includes analyses of the environmental impacts that could occur if the Project were to be built, operated, and maintained for up to 35 years, and eventually decommissioned at the end of that lifespan. This timeframe is based on the 2022 ASC; however, the Project has the potential to operate longer if re-powered. This chapter also describes the potential environmental impacts associated with the No Action Alternative.

[1] The Applicant provided three locations for consideration of constructing the two BESS. An analysis for all the components and distinct parts as presented in Table 2.1-1 of the ASC has been completed where enough information was provided to do so..

“Impacts” are the effects or consequences of actions (Washington Administrative Code [WAC] 197-11-752) upon the environmental resources listed in Chapter 3. Two types of environmental impacts are described in this chapter:

- Direct impacts are the effects of an action (i.e., construction, operation and maintenance, or decommissioning) on a resource that occurs at the same time and place as the action. An example of a direct impact would be increased noise levels experienced by residents living near a construction site.
- Indirect impacts are similar to direct impacts in that they are caused by an action; however, they occur later in time or occur farther from the activity causing the impact. An example of an indirect impact would be a decline in numbers of a wildlife species due to fragmentation of that species’ habitat by installation of fencing.

A third type of environmental impact, *cumulative impact*, occurs as a result of incremental direct and indirect impacts on resources from a project or plan, past and present actions, and other reasonably foreseeable developments (RFDs). Chapter 5 Cumulative Impacts of this EIS presents an analysis of cumulative impacts.

In accordance with the Washington State Environmental Policy Act (SEPA), this EIS weighs the likelihood of occurrence with the severity of an impact (WAC 197-11-794) and considers several factors when analyzing potential impacts. Factors included in the analysis and rating of impacts are described in **Table 4.1-1**.

Table 4.1-1: Impact Ratings Considered in the Analysis of Potential Impacts

Factor	Rating →			
Magnitude[(a)]	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Note:
[a] Magnitude ratings are further characterized and specific to each element of the environment in this chapter.

This EIS presents analysis of impacts for each of the three Project stages (construction, operation, and decommissioning) on the elements of the environment identified in Chapter 3. The direct and indirect impacts associated with the Proposed Action and under the No Action Alternative are described quantitatively in this EIS if sufficient data or information were provided in the ASC or subsequent data requests to do so. When detailed information was not available, and that information was not essential to determining the level of adverse environmental impacts, impacts are described qualitatively. For the decommissioning stage, which would occur over 35 years in the future, the exact impacts cannot be determined with certainty as conditions may change; for example, if more of the area is converted to residential use, then the impacts on land use could be different. The analysis uses the best available information to predict the significance of decommissioning-related impacts and uses the word “anticipate” to indicate that these are predictions rather than certainties. As mentioned above, EFSEC may request that additional studies be completed as a form of mitigation prior to decommissioning of the Project.

Impacts that are “similar” in nature but not exactly the same and are rated with the same magnitude, duration, likelihood, and spatial extent may be described as “similar” in this EIS. For example, impacts on wastewater during decommissioning of turbines under Turbine Option 1 would be similar to those described for construction of Turbine Option 1. The impact characterization presented herein considers the Applicant-committed measures and best management practices proposed in the ASC. The Applicant-committed measures and best management practices are intended to avoid or reduce potential impacts. Some Applicant-committed measures may be existing requirements in rule or law. Chapter 2 presents a list of the Applicant-committed measures.

A table (Summary of Potential Impacts) at the end of each resource section summarizes the adverse environmental impacts of the project as detailed in the preceding text. The magnitude ratings of negligible or low on their own indicate a finding of no significant adverse environmental impacts. The magnitude ratings of medium or high indicate the potential for significant adverse environmental impacts and warrant identification of additional mitigation to reduce the impact.

This EIS does not always recommend additional mitigation measures to further reduce impacts that are characterized as either medium or high magnitude. For those impacts, the Applicant commitment often represents the most effective means available of addressing adverse impacts to the affected resource. Furthermore, recommending additional measures would not be effective in reducing impacts beyond what the Applicant commitment would address.

The impact discussion is organized by various individual components (e.g., Turbine Option 1, Turbine Option 2, solar arrays). It also includes the comprehensive Project, which is the main consideration for understanding the impacts of the total proposal. This additional information about individual components can identify which, if any, components are contributing to a medium or high impact and will assist in further examination of possible options to mitigate the impact of those components and, ultimately, reduce the impact of the comprehensive proposal.

4.1.2 Mitigation

Mitigation measures can be implemented to avoid or reduce impacts associated with the construction, operation and maintenance, and decommissioning of the Project. According to SEPA (WAC 197-11-768), “mitigation” means the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action

- Minimizing impact by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- Compensating for the impact by replacing, enhancing, or providing substitute resources or environments
- Monitoring the impact and taking appropriate corrective measures

Mitigation is identified in the EIS after considering the application of existing laws and rules and all applicant-identified commitments to the Project. In Chapter 4, it is referred to as “Recommended Mitigation.” These mitigation measures may be imposed by EFSEC pursuant to their authority under Revised Code of Washington 80.50 or through the use of their SEPA “substantive authority,” which provides the ability to condition or deny a proposal based on environmental impacts (WAC 197-11-660). Mitigation decisions are at the discretion of EFSEC. These may include, but not be limited to, mitigation identified in the EIS, other mitigation identified outside the EIS, or mitigation identified during adjudication.

The development of mitigation is ongoing during the SEPA process and can even continue after the publication of the EIS. That allows for mitigation to evolve and be refined as more information is collected during the whole EIS process, including the public comment period. Mitigation that may be applied to a project, should it be approved, does not have to be finalized during the SEPA process (e.g., development of mitigation by a Technical Advisory Committee formed for an approved project, or EFSEC imposed mitigation that is identified during adjudication). However, any mitigation that is applied to a project using SEPA substantive authority must meet the requirements of WAC 197-11-660 Substantive authority and mitigation. One requirement of WAC 197-11-660, section (1)(b), states: “Mitigation measures shall be related to specific adverse environmental impacts clearly identified in an environmental document on the proposal and shall be stated in writing by the decision maker.” In this case, the environmental document is the EIS and the decisionmaker is EFSEC.

Post-Adjudication Applicant Commitments

Prior to finalizing the EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns. As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the expected changes to the Project made in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, and information received from the Bonneville Power Administration (BPA). The Post-Adjudication Applicant Commitments were identified and finalized in the Applicant’s Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023).

4.2 Earth Resources

This section assesses potential impacts on earth resources within the Lease Boundary of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) and Project vicinity. Additionally, this section evaluates the potential for geologic hazards originating within the Lease Boundary, Project vicinity, and Pacific Northwest region to impact the Project. The Project vicinity includes the areas 4 miles south/southwest of the City of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River. The affected environment for earth resources is presented in Section 3.2.

The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and shown in **Table 4.2-1** and acreage impacts presented in Section 2.0. Potential impacts are assessed for geology, soils, topography, and geologic hazards during Project construction, operation, and decommissioning.

Due to the Pacific Northwest’s active geology, this section analyzes potential impacts on Project components from earthquakes, volcanic activity, landslides, tsunamis, and seiches.

Table 4.2-1: Impact Rating Table for Earth Resources from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

As identified in **Table 4.2-2**, the determination of impact magnitude is based on impacts on the nature and type of earth resources, impacts on earth resources, and compliance with state and county requirements.

Table 4.2-2: Criteria for Assessing Magnitude of Impacts on Earth Resources

Magnitude of Impacts	Description
Negligible	**Landscape character:** Landscape would appear unaltered. **Safety:** No change to existing.
Low	**Landscape character:** Landscape would be noticeably altered by changes to the surface of the earth but would not affect the structural integrity of the facilities. **Safety**: No anticipated change to existing.
Medium	**Landscape character:** Landscape would appear considerably altered and may affect the structural integrity of the facilities. **Safety**: A potential geologic hazard could result in an injury to an individual.
High	**Landscape character:** Landscape would appear severely altered and would affect the structural integrity of the facilities. **Safety**: A potential geologic hazard would result in a fatality to an individual.

4.2.1 Method of Analysis

For the assessment of impacts on earth resources from Project development, as well as impacts on the Project from geologic hazards, this section analyzes and compares the following documentation:

- Regulatory requirements and applicable codes and standards
- Horse Heaven Wind Farm, LLC's (Applicant) preliminary geotechnical study of the Lease Boundary (Horse Heaven Wind Farm, LLC 2022)
- Geomorphological and geological characteristics of the Lease Boundary, Project vicinity, and Pacific Northwest (provided in Section 3.2)
- Benton County Natural Hazard Mitigation Plan (Benton County 2019)

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts related to earth resources are discussed in Section 2.1.3.1 and summarized below.

- A stabilized construction entrance/exit would be installed at locations where construction vehicles would access newly constructed roads and/or disturbed areas from paved roads. The stabilized construction entrance/exits would be inspected and maintained for the duration of the Project's lifespan.
- Clearing, excavation, and grading would be limited to those areas of the Project area absolutely necessary for construction of the Project. Areas outside the construction limits would be marked in the field, and equipment would not be allowed to enter these areas or disturb existing vegetation. To the extent

practicable, existing vegetation would be preserved. Where vegetation clearing is necessary, root systems would be conserved if possible.

- Vegetated areas that are disturbed or removed during construction would be restored as nearly as reasonably possible to pre-disturbance conditions.
- Excavated soil and rock from grading would be spread across the site to the natural grade and would be reseeded with native grasses to control erosion by water and wind.
- Silt fencing would be installed throughout the Project as a perimeter control and on the contour downgradient of excavations, the operation and maintenance facilities, and substations.
- Straw wattles would be used to decrease the velocity of sheet flow stormwater to prevent erosion. Wattles would be used along the downgradient edge of access roads adjacent to slopes or sensitive areas.
- Mulch would be used to immediately stabilize areas of soil disturbance, and during reseeding efforts.
- Jute matting, straw matting, or turf reinforcement matting would be used in conjunction with mulching to stabilize steep slopes that were exposed during access road installation.
- Soil binders and tackifiers would be used on exposed slopes to stabilize them until vegetation is established.
- Concrete chutes and trucks would be washed out in dedicated areas near the foundation construction locations. This would prevent concrete washout water from leaving a localized area. Soil excavated for the concrete washout area would be used as backfill for the completed footing to ensure that the surface soils maintain infiltration capacity.
- To facilitate installation of the wind turbine generator (turbine) footings, large excavations would be created. Soil from these excavations would be temporarily stockpiled and used as backfill for the completed footing. Silt fencing would be installed around the stockpile material as a perimeter control. Mulch or plastic sheeting would be used to cover the stockpiled material. Soils would be stockpiled and reused to prevent mixing of productive topsoil with deeper subsoils.
- After construction is completed, the site would be revegetated with an approved seed mix. When required, the seed would be applied in conjunction with mulch and/or stabilization matting to protect the seeds as the grass establishes. Revegetation would take place as soon as site conditions and weather allow following construction.
- If water crossings are needed, check dams and sediment traps would be used during construction of low-impact ford crossings or culvert installations. The check dams and sediment traps would minimize downstream sedimentation during construction of the stream crossings.
- To the extent practicable, construction activities would be scheduled in the dry season, when soils are less susceptible to compaction. Similarly, soil disturbance should be postponed when soils are excessively wet such as following a precipitation event.
- A Revegetation Plan was prepared by the Applicant (Appendix N, Horse Heaven Wind Farm, LLC 2022). The Revegetation Plan describes methods, success criteria, monitoring, and reporting for revegetation of

areas that would be temporarily disturbed during construction of the Project. A summary of key measures presented in the Revegetation Plan is provided below.

- Following construction, temporarily disturbed areas would be revegetated with native plant species, or non-invasive, non-persistent non-native plant species, as described in the Revegetation and Noxious Weed Management Plan. The plan calls for revegetation of agriculture land to occur in consultation with the landowner. Non-agricultural land would be seeded.
- The Applicant provided four example seed mixes containing native plants to the area, but the final composition of seed mixes would be determined based on preconstruction conditions and the availability of seed at the time of procurement. Two grassland seed mixes and two shrub-steppe seed mixes are proposed.
- Modified habitat would be replanted under the solar arrays as described in the Revegetation and Noxious Weed Management Plan. The seed mix identified for the modified habitat includes low-growing grasses and forbs: Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Elymus elymoides*), prairie junegrass (*Koeleria macrantha*), milkvetch (*Astragalus sp.*), shaggy fleabane (*Erigeron pumilus*), and woolly plantain (*Plantago patagonica*).
- Revegetation monitoring would be conducted annually for a minimum of three years unless the landowner converted the areas (e.g., to agriculture land). Following annual monitoring, a monitoring report would be prepared that would include recommendations for remedial actions, if any. Monitoring reports would be submitted to the Washington Energy Facility Site Evaluation Council (EFSEC) within 60 days of the annual monitoring inspection.

The success criteria identify trigger points that would require modifications to the Revegetation Plan based on the monitoring reports. For example, should total coverage from seeding not meet the success criteria, the environmental monitor may indicate areas that require additional seeding or soil amendments. Remedial action would be identified where the success criteria are not met by Year 3 (for revegetated grassland habitat) or Year 5 (for revegetated shrub-steppe habitat), which may include reseeding, planting with container plants, additional weed control, and other measures as needed.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.2.2.8, Post-Adjudication Applicant Commitments.

4.2.1.1 Regulatory Requirements and Applicable Codes and Standards

The State of Washington Water Pollution Control Act requires compliance with the National Pollutant Discharge Elimination System (NPDES) through a Construction Stormwater General Permit. The NPDES Construction General Permit would require that the Applicant prepare a Stormwater Pollution Prevention Plan that specifies the activities and conditions at the site that could cause water pollution and the steps the contractor must take to prevent the discharge of any unpermitted pollution.

The State of Washington has adopted the 2018 International Building Code (IBC) standards with statewide amendments, effective February 1, 2021. The 2018 IBC provides design-level seismic parameters consistent with the requirements of the American Society of Civil Engineers Standard 7-16 for Minimum Design Loads and Associated Criteria for Buildings and Other Structures. The seismic design parameters are dependent on the structural requirements based on occupancy. The Project would include structures with occupancy categories between I and IV.[2] The Applicant has identified seismic design parameters consistent with the Washington State building code (Horse Heaven Wind Farm, LLC 2022).

The Applicant's 2022 ASC indicates that a final site-specific geotechnical analysis would be reported in a subsequent geotechnical engineering report and geotechnical engineering risk assessment that meets the Benton County Critical Area requirements outlined in Benton County Code (BCC) 15.12.040 and 15.12.050. The Applicant's 2022 ASC states that the geotechnical risk assessment would be prepared by a qualified professional meeting the standards specified in BCC 15.02.070(57) (Horse Heaven Wind Farm, LLC 2022) per Washington Administrative Code (WAC) 463-62-020.

4.2.1.2 Preliminary Geotechnical Study

The Applicant's preliminary geotechnical investigation included the following elements:

- Geotechnical drilling with standard penetration testing at 17 locations within the Wind Energy Micrositing Corridor
  - Retrieval of 16 soil borings from potential wind turbine locations that were advanced to a target depth of 60 feet below ground surface (bgs)
  - Retrieval of one soil boring from a representative substation site that was advanced to a target depth of 50 feet bgs
- Collection of soil samples from all boring locations for laboratory testing

When a boring could not be advanced beyond 30 feet bgs due to hard ground conditions, the Applicant's team cored rock to depths of 5 to 20 feet below the depth of refusal. According to the preliminary geotechnical investigation report submitted with the 2022 ASC, rock coring was performed at two proposed wind turbine locations (Horse Heaven Wind Farm, LLC 2022).

4.2.1.3 Project Comparison to Existing County Natural Hazard Mitigation Planning Goals and Objectives

Table 4.2-3 presents a comparison of the Project with the relevant goals of the Benton County Natural Hazard Mitigation Plan.

[2] Each building and structure shall be assigned a structural occupancy category in accordance with the 2018 IBC. Category I represents buildings and other structures that represent a low hazard to human life in the event of failure; Category II represents building and other structures except those listed in Categories I, III, and IV; Category III represents buildings and other structures that represent a substantial hazard to human life in the event of failure; and Category IV represents buildings and other structures designed as essential facilities.

Table 4.2-3: Project Comparison with the Local Hazardous Area Program's Mitigation Goals and Objectives

Goal/Policy	Project Comparison
Goal 6: Local governments support hazard mitigation planning and support the implementation of the mitigation action items for their jurisdiction.	It is anticipated that the Project would be consistent with this hazard mitigation goal as the 2022 ASC states that final geotechnical analyses would be used to calculate the bearing capacity of the soils, conduct stability analyses, and provide engineering recommendations for construction of the structures in accordance with applicable state codes and standards.
Goal 6 Objective E: Support the location of new facilities outside of areas vulnerable to the impacts of natural hazards.	It is anticipated that the Project would be consistent with this hazard mitigation goal and objective as the 2022 ASC states that infrastructure would be sited to avoid steep slopes and areas of susceptible soils.
Goal 6 Objective F: Design facilities to withstand the impacts of a disaster when it is not feasible to relocate them.	It is anticipated that the Project would be consistent with this hazard mitigation goal and objective as the Applicant has committed to performing a geotechnical engineering risk assessment meeting the Benton County Critical Area requirements outlined in BCC 15.12.040 and 15.12.050 prior to construction.

Source: Benton County 2019
ASC = Application for Site Certification; BCC = Benton County Code; NPDES = National Pollutant Discharge Elimination System

4.2.2 Impacts of Proposed Action

The following sections assess potential impacts on earth resources, and impacts from geohazards, for each of the Project's components and the whole of the Project for each stage of the Project. Impacts on earth resources from construction, operation, and decommissioning could increase soil erosion or alter topography, and impacts from geological hazards on the Project's components could adversely affect the Project's viability.

Indirect impacts would not be anticipated because the Project is not expected to substantially induce regional growth to an extent that would significantly change off-site geology and soil resources or increase the likelihood that a geologic hazard event would occur.

4.2.2.1 Impacts on Earth Resources during Construction

The Project would permanently impact up to 6,869 acres and temporarily impact up to 2,957 additional acres,[3] during construction. Impacts on earth resources would be anticipated throughout the construction stage, due to altering or removing bedrock, causing soil erosion and compaction, and changing the topography within the Lease Boundary. The following are examples of construction activities that may impact earth resources:

- **Site Mobilization:** The movement of personal vehicles, work trucks, and heavy equipment to and from the Lease Boundary has the potential to track soil off site and increase soil compaction on site.
- **Clearing and Grubbing:** Clearing and grubbing soil and vegetation could lead to soil erosion as the substrate becomes exposed to wind and stormwater runoff. Additionally, clearing and grubbing cold cause soil compaction and changes to surface drainage patterns as infiltration rates decrease.
- **Earthwork:** Impacts on soils and topography would occur as the Project achieves the appropriate grades and subsurface conditions for the construction and installation of access roads, foundations, and temporary

[3] Overlapping permanent disturbance area is subtracted from temporary impact corridors/areas.

crane pads. Earthwork can lead to soil compaction, changes in surface drainage patterns, and fugitive dust as the soil becomes exposed to wind and stormwater runoff, and infiltration rates can decrease, causing a potential increase in localized erosion. The erosion impacts detailed in this section do not include natural erosion processes and are specifically related to impacts from the Project.

- **Installation of Foundations:** The installation of support pilings in bedrock, or other foundation construction techniques, may impact geology. For instance, if basalt is encountered, its removal would impact geological resources.

Turbine Option 1

Impacts on geology from the construction of turbines under Turbine Option 1 would be low, constant, probable, and limited to the specific turbine construction footprint. Specifically, adverse impacts on geology would occur from installing Turbine Option 1's deep foundations. The turbine foundation depths are expected to be between 9 and 12 feet bgs. The Applicant's preliminary geotechnical investigation study encountered basalt bedrock at six boring locations within the Lease Boundary. Basalt was encountered between 5 and 45 feet bgs, with one boring, WTG-235, encountering basalt at less than 12 feet bgs with basalt beginning at a depth of 5 feet bgs. Due to the potential for shallow bedrock to be present within the Lease Boundary, construction activities could impact geological resources. However, the basalt is expected to be at a sufficient depth that it is unlikely to be encountered during the construction of turbine foundations.

The severity of geology (bedrock) impact during construction is anticipated to be feasible and low because subsurface construction activities would rarely[4] be expected to encounter bedrock. If construction activities do encounter bedrock, the impacts, although constant, would be limited to the area of a specific wind turbine or building foundation. When construction workers encounter bedrock, the highly weathered basalt near the top of the rock surface is expected to be mechanically excavated. Blasting of bedrock may be required if less weathered basalt is encountered at shallow depths.

Impacts on soils resources from the construction of turbines under Turbine Option 1 would be low, short term, unavoidable, and confined within the Lease Boundary. These activities would likely include site clearing, excavation, and backfilling. The construction and erection of turbine tower foundations would disturb soil resources as the contractor excavates unsuitable material from the Project area. The disturbance to natural soil profiles could result in a temporary increase in soil erosion.

Impacts on topography from construction of turbines under Turbine Option 1 would be low, short term, unavoidable, and confined within the Lease Boundary. Construction activities that would impact topography include excavation, grading, and cut-and-fill-slope development. Limited grading and/or placement of additional fill may be needed to obtain necessary grades for access roads, building foundations, and leveling the ground. Surface disturbance from construction-related activities would impact topography around each turbine.

Turbine Option 2

Although slight decreases in the amount of disturbance to geology (bedrock), soil, and topography would be expected, as fewer turbines would be constructed under Turbine Option 2, construction-related impacts on earth resources under this option would be similar to those discussed for Turbine Option 1. Impacts on geology would

[4] One in 17 borings encountered bedrock at less than 12 feet bgs (within the expected turbine foundation depth) during preliminary geotechnical investigations (Westwood Professional Services 2020).

be low, constant, feasible, and limited to the installation footprint of the turbines. Impacts on soils resources from the construction of turbines under Turbine Option 1 would be low, short term, unavoidable, and confined within the Lease Boundary. Impacts on topography from construction of turbines under Turbine Option 1 would be low, short term, unavoidable, and confined within the Lease Boundary.

Solar Arrays

The impact on geology during solar array construction is anticipated to be low, constant, unlikely, and limited to the footprint of disturbance. Impacts on soil and topography from the construction of solar arrays would be similar to those discussed for construction of turbines under Turbine Option 1. Impacts on soils resources from the construction of solar arrays would be low, short term, unavoidable, and confined within the Lease Boundary. Impacts on topography from construction of solar arrays would be low, short term, unavoidable, and confined within the Lease Boundary.

Battery Energy Storage Systems

Battery energy storage systems (BESS) designs vary depending on manufacturer, technology, chemistry, etc. Battery production requires a large amount and wide range of raw materials, including metals and non-metals. The battery industry can generate considerable amounts of environmental pollutants during different processes such as mining, manufacturing, use, storage, treatment, disposal, and recycling (Dehghani-Sanij et al. 2019). The level of mining required depends on the recyclability of the type of BESS used. As more BESS are constructed and, in time, reach their end-of-life, it is important to note that many of the raw materials can currently be recycled and additional materials may be able to be recycled in the future with improvements to recycling methods. Although battery manufacturing is considered pollution-generating, advancements are being made within the industry to reduce its impact, increase its circularity, and ultimately demonstrate sustainable benefits over fossil fuel alternatives. The individual impacts for the manufacturing of the model of BESS required for this Project are not quantifiable and are not analyzed in this chapter. Additionally, it is expected that the manufacturing facilities would have their own environmental analysis.

Impacts on soils and topography from the construction of the BESS would be similar to those discussed for solar arrays: low, short term, unavoidable, and confined. Encountering bedrock is not expected; therefore, impacts on geology from the construction of BESS are low, constant, unlikely, and limited from the construction of the BESS.

Substations

Impacts on geology, soils, and topography from the construction of the substation(s) would be similar to those discussed for the BESS. Impacts on geology from the construction of substations are low, constant, unlikely, and limited to the disturbance footprint of the substations. Impacts on soils and topography from the construction of the substations would be low, short term, unavoidable, and confined.

Comprehensive Project

Impacts on geology, soils, and topography from construction of the Project as a whole are anticipated to be similar to those discussed for construction of turbines under Turbine Option 1: impacts on geology from the construction of the comprehensive Project are low, constant, feasible, and limited to the footprint of disturbance for the Project and impacts on soils and topography from the construction of the comprehensive Project would be low, short term, unavoidable, and confined.

4.2.2.2 Impacts on Earth Resources during Operations

The Project's operation stage would be associated with facility operations and maintenance. While most earthwork and subsurface foundation work would be completed during the construction stage, additional fill or aggregate materials may be needed to repair roads and underground utilities during the operation stage. The surface topography of the site would not be altered after the construction of the Project is complete.

Turbine Option 1

Operational activities associated with the Project include maintenance of the wind farm infrastructure and ongoing use of access roads and cleared areas. Impacts on geological resources under Turbine Option 1 operations would be negligible, temporary, feasible, and limited to the maintenance area. During operational procedures, impacts on the underlying basalt bedrock would be negligible because maintenance activities are not expected to include deep excavations that encounter geologic resources.

Operations under Turbine Option 1 would result in a low, temporary, feasible, limited impact on soil resources. It is anticipated that no new ground disturbance would occur during the Project's operation stage. During the operation stage, access roads and cleared areas could be susceptible to increased soil erosion from a lack of stabilizing vegetation or hard cover and prior disturbance of the local soil profile. Project operations would have a low impact on soil erosion because operations would be limited to gravel-surfaced areas, including the apron constructed around each turbine.

Operations under Turbine Option 1 would result in a negligible, temporary, unlikely, limited impact on the topography within the Lease Boundary. Impacts on topography during operational stages would be negligible, with an unlikely chance of occurring because facility operation would not require further excavation of existing ground surfaces or additional grading. Furthermore, it is anticipated that ground improvement techniques used during the construction stage would mitigate soils susceptible to erosion by improving their engineering performance and reducing their potential for settlement.

Turbine Option 2

Operations under Turbine Option 2 would result in impacts on geology, soils, and topography similar to those discussed for operation of turbines under Turbine Option 1.

Solar Arrays

Impacts on geology, soils, and topography from operation of the solar arrays would be similar to those discussed for operation of turbines under Turbine Option 1.

Battery Energy Storage Systems

Impacts on geology, soils, and topography from operation of the BESS would be similar to those discussed for operation of turbines under Turbine Option 1.

Substations

Impacts on geology, soils, and topography from the operation of substations would be similar to those discussed for operation of turbines under Turbine Option 1.

Comprehensive Project

Impacts on geology, soils, and topography from the operation of the Project as a whole would be similar to those discussed for operation of turbines under Turbine Option 1.

4.2.2.3 Impacts on Earth Resources during Decommissioning

The Applicant would decommission the Project following the anticipated Project life of up to 35 years, or a successful re-powering of the Project's components that could extend the length of the operation stage. The removal of aboveground Project infrastructure, and land restoration within the Project footprint, may present temporary or short term impacts on localized areas within the Lease Boundary.

Turbine Option 1

Impacts on geology from decommissioning of turbines under Turbine Option 1 would be low, temporary, probable, and limited to areas of previous development. The likelihood of a foundation removal encountering bedrock is low. If bedrock were to be impacted during the decommissioning stage, then it would likely have already been encountered during the construction stage.

The Applicant has stated in the 2022 ASC that upon decommissioning the Project, underground facilities would be removed to a minimum depth of 3 feet bgs. The severity of the impact on soils from the decommissioning under Turbine Option 1 is anticipated to be low, short term, unavoidable, and limited to areas of previous development. Decommissioning activities associated with the Project could impact and disturb the soil profile due to excavating foundations and utilities, removing unsealed areas, restoring the original ground profile, and rehabilitating vegetation.

Impacts on topography during the decommissioning stage would be low, short term, probable, and limited to areas of previous development as the Applicant restores the original topographic profile.

Turbine Option 2

Although slight decreases in the amount of disturbance to geology (bedrock), soil, and topography would be expected, as fewer turbines would be dismantled under Turbine Option 2, impacts on geology, soils, and topography from decommissioning under this option would be similar to those discussed for Turbine Option 1.

Solar Arrays

Impacts on geology, soils, and topography from the decommissioning of solar arrays would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Battery Energy Storage Systems

Impacts on geology, soil, and topography from decommissioning of BESS would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Substations

Impacts on geology, soils, and topography from decommissioning of substations would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Comprehensive Project

Impacts on geology, soils, and topography from decommissioning of the Project as a whole would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

4.2.2.4 Impacts from Geological Hazards on Construction

Geological hazards may occur from sources within the Project Lease Boundary and regional sources. There are 812 acres of geologically hazardous areas (combined erosion hazard areas and steep slope areas) within the

Wind Energy Micrositing Corridor and 627 acres within the Solar Siting Areas (Horse Heaven Wind Farm, LLC 2022). The geologically hazardous areas are associated with erosion hazards and steeply sloped areas.

The 2022 ASC for the Project states that the final siting of Project components would be developed to avoid geological hazards. Therefore, no impacts are expected in areas identified as having combined erosion hazards and steep slopes, landslides, or liquefaction. The impacts discussed below are based on information from both site-specific and regional sources. Because the Project vicinity is in eastern Washington and surrounded by land, adverse impacts from tsunamis and seiches are not discussed below.

Turbine Option 1

Earthquakes: Several mapped fault systems are known to occur within the Project vicinity, and unmapped faults may occur within the Lease Boundary. The Applicant's 2022 ASC states that the proposed Wind Energy Micrositing Corridor is not located near known faults, and turbines would not be placed near faults. Accordingly, impacts from surface fault rupture under Turbine Option 1 are unknown because faults have not been mapped within the Lease Boundary, though no historic earthquake epicenters have historically occurred within the Lease Boundary to indicate the existence of a buried or unmapped fault.

Prolonged earthquake-induced ground shaking could cause minor damage to infrastructure if shaking has an intensity and duration that exceeds structural design levels. The severity of potential impacts from ground shaking is low but feasible, as Turbine Option 1 would meet Washington State building codes for seismic design. The hazard of ground shaking is not expected to impact construction because regional earthquakes that result in noticeable ground shaking are rare. Any impacts would be temporary across the Project and confined in their extent.

Liquefaction can increase the impact earthquakes have on structures and increase the chances of ground failure. Individually, the liquefaction hazard is considered negligible and unlikely. As shown in Figure 3.2-6, soils susceptible to liquefaction during strong ground shaking are located only within the drainage channels at the base of the valleys between the steep ridges. The Applicant's 2022 ASC states that Project components would not be developed in areas with soils susceptible to liquefaction.

Impacts related to earthquakes have been combined in **Table 4.2-4a** for the purposes of this analysis. The impact of earthquakes on construction of the Project under Turbine Option 1 is anticipated to be negligible, temporary, feasible, and confined to the Lease Boundary.

Landslide Hazards and Ground Instability: The impact of landslide hazards and ground instability on the construction of turbines under Turbine Option 1 would be low, temporary, unlikely, and limited. The Project site includes areas susceptible to landslides and bluff failures. Existing ground instability, high rainfall rates, and strong earthquake shaking could cause landslides.

There are 812 acres of geologically hazardous areas within the Wind Energy Micrositing Corridor and 627 acres within the Solar Siting Areas (Horse Heaven Wind Farm, LLC 2022). Existing steep and unstable slopes are at the greatest risk of developing landslides. Steep slopes (≥15 percent grade) with a high potential for erosion are located perpendicular to the north and south of the Horse Heaven ridgeline.

As illustrated in Figure 3.2-6, evidence of two landslides has been identified just within the site's northern edge. These deposits are not within the Wind Energy Micrositing Corridor. Additionally, the Applicant's 2022 ASC states that Project components would not be located in areas susceptible to landslides and ground instability. The severity of potential impacts from landslides is anticipated to be low because Project facilities would be located to avoid steep slopes and drainage areas.

Volcanic Activity: The impact of volcanic activity on Project construction is anticipated to be negligible, temporary, unlikely, and confined to the Lease Boundary. Impacts on Project construction from volcanic activity are unlikely because of the distance between local volcanic centers and their frequency of occurrence. If a Cascade volcano were to erupt, volcanic ashfall, under favorable wind conditions, could reach the Lease Boundary. Hazards from ashfall to construction activities would include the following:

- Accumulation on structures
- Clogging of electronics, machinery, and filters
- Suspension of abrasive fine particles in air and water
- Accumulation on transportation routes and vegetation

The Cascades Volcano Observatory in western Washington maintains an extensive seismic network to monitor regional volcanoes. In an impending eruption, the observatory would issue widespread warnings. A large eruption resulting in ashfall and ash accumulation would create a temporary impact. It is anticipated that construction would resume once safe conditions allowed construction activities to proceed.

Turbine Option 2

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on construction of turbines under Turbine Option 2 would be similar to those discussed for construction of turbines under Turbine Option 1.

Solar Arrays

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on construction of the solar arrays would be similar to those discussed for construction of turbines under Turbine Option 1.

Battery Energy Storage Systems

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the construction of the BESS would be similar to those discussed for construction of turbines under Turbine Option 1.

Substations

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the construction of the substations are anticipated to be similar to those discussed for construction of turbines under Turbine Option 1.

Comprehensive Project

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the construction of the Project as a whole would be similar to those discussed for construction of turbines under Turbine Option 1.

4.2.2.5 Impacts from Geohazards on Operations

Turbine Option 1

Earthquakes: Several mapped fault systems are known to occur within the Project vicinity, and unmapped faults may occur within the Lease Boundary. The Applicant's 2022 ASC states that the Wind Energy Micrositing Corridor are not located near known faults, and the Applicant would not place turbines near any faults if they are detected by subsequent geotechnical investigations. Because no historic earthquake epicenters are located within the Lease Boundary, the applicable severity determination is low.

Prolonged earthquake ground shaking could cause minor damage to infrastructure if the intensity and duration of the shaking exceed structural design levels. The severity of potential impacts from ground shaking is low but feasible. The hazard of ground shaking is not expected to impact operations as regional earthquakes rarely exhibit noticeable ground shaking. Additionally, the Applicant would construct turbines under Turbine Option 1 in accordance with Washington State building codes that address risks associated with seismicity. Any impacts would be temporary across the Project and confined in extent.

Liquefaction can increase the impact earthquakes have on structures and increase the chances of ground failure. Individually, the liquefaction hazard is considered negligible and unlikely. As shown in Figure 3.2-6, soils susceptible to liquefaction during strong ground shaking are located only within the drainage channels at the base of the valleys between the steep ridges. The Applicant's 2022 ASC states that Project components would not be developed in areas with soils susceptible to liquefaction.

Impacts related to earthquakes have been combined in **Table 4.2-4b** for the purposes of this analysis. The impact of earthquakes on operation of the Project under Turbine Option 1 is anticipated to be low, temporary, feasible, and confined to the Lease Boundary.

Landslides Hazards and Ground Instability: The Applicant's 2022 ASC states that Project components would not be located in areas susceptible to landslides and ground instability. Analysis found that the Project site includes areas susceptible to landslides and bluff failures. Existing ground instability, high rainfall rates, and strong earthquake shaking could cause landslides. The impact of landslide hazards and ground instability on the operation of turbines under Turbine Option 1 would be low, temporary, unlikely, and limited to developed areas. The severity of potential impacts from landslides is considered low because Project facilities would be located to avoid steep slopes and drainage areas.

Volcanic Activity: The impact of volcanic activity on turbine operations under Turbine Option 1 is anticipated to be negligible, temporary, unlikely, and confined to the Lease Boundary. Impacts of volcanic activity on turbine operation are unlikely because of the distance between local volcanic centers and their frequency of occurrence. If a Cascade volcano were to erupt, volcanic ashfall combined with favorable wind conditions could reach the Lease Boundary. Hazards from ashfall to Project operations would include the following:

- Accumulation on structures
- Clogging of electronics, machinery, and filters
- Suspension of abrasive fine particles in air and water
- Accumulation on transportation routes and vegetation

The Cascades Volcano Observatory in western Washington maintains an extensive seismic network to monitor regional volcanoes. In an impending eruption, the observatory would issue widespread warnings. A large eruption resulting in ashfall and ash accumulation would create a temporary impact, possibly including cessation of operations and additional maintenance activities to restore proper function of equipment. It is anticipated that operations would resume once safe conditions allowed energy production to continue.

Turbine Option 2

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the operation of turbines under Turbine Option 2 would be similar to those discussed for operation of turbines under Turbine Option 1.

Solar Arrays

Impacts from landslide hazards, ground instability, and volcanic activity on the operation of solar arrays during construction, operation, and decommissioning would be low, temporary, unlikely, and limited to the solar arrays within the Lease Boundary. Impacts from earthquakes during construction, operation, and decommissioning would be low, temporary, unlikely, and confined to the solar arrays within the Lease Boundary. These environmental incidents, including ashfall and ash accumulation from volcanic activity, would have the potential to reduce the power generated by individual solar panels as well as damage the solar arrays' other components (GFZ 2017). It is assumed that these impacts would be temporary and that the Applicant would repair the solar panels and other components as soon as safe to do so.

Battery Energy Storage Systems

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the operation of BESS would be similar to those discussed for operation of turbines under Turbine Option 1.

Substations

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the operation of substations would be similar to those discussed for operation of turbines under Turbine Option 1.

Comprehensive Project

Impacts from on geohazards during operation of the Project as a whole would be low, temporary, unlikely, and limited to the individual structures and areas of disturbance within the Lease Boundary.

4.2.2.6 Impacts from Geohazards on Decommissioning

Following the operations stage of the Project, the Applicant would decommission the Project site. The removal of Project infrastructure, and land restoration within the Project footprint, may present temporary or short-term impacts on localized areas within the Lease Boundary.

Turbine Option 1

Earthquakes: Impacts from earthquakes on the decommissioning of turbines under Turbine Option 1 would be similar to those discussed for the construction of turbines under Turbine Option 1. The impact of earthquakes on the decommissioning of turbines under Turbine Option 1 is anticipated to be negligible, temporary, feasible, and confined to the Lease Boundary.

Landslide Hazards and Ground Instability: Impacts from landslide and ground instability on the decommissioning of turbines under Turbine Option 1 would be similar to those discussed for the construction of turbines under Turbine Option 1. The impact of landslide hazards and ground instability on the decommissioning of turbines under Turbine Option 1 is anticipated to be low, temporary, unlikely, and limited to developed areas.

Volcanic Activity: Impacts from volcanic activity on the decommissioning of turbines under Turbine Option 1 would be similar to those discussed for the construction of turbines under Turbine Option 1. The impact of volcanic activity on turbine decommissioning is anticipated to be negligible, temporary, unlikely, and confined.

Turbine Option 2

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the decommissioning of turbines under Turbine Option 2 would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Solar Arrays

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the decommissioning of solar arrays would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Battery Energy Storage Systems

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the decommissioning of BESS would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Substations

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the decommissioning of substations would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

Comprehensive Project

Impacts from earthquakes, landslide hazards, ground instability, and volcanic activity on the decommissioning of the Project as a whole would be similar to those discussed for decommissioning of turbines under Turbine Option 1.

4.2.2.7 Recommended Mitigation Measures

This section describes measures that would reduce or compensate for impacts related to earth resources from construction, operation, and decommissioning of the Project. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

The intensity of adverse impacts on earth resources can be minimized or reduced through the implementation of mitigation measures, as described below. The Applicant would be responsible for implementing prescribed mitigation measures during the Project's preconstruction, construction, operation, and decommissioning stages. EFSEC has identified the following additional and modified mitigation measures for the Project to avoid and/or minimize potential impacts related to earth resources:

Geo-1:[5] Minimize soil disturbance activities with the potential for soil compaction when soils are saturated, such as following a major precipitation event (e.g., five-day antecedent rainfall of greater than 1.1 inches during mid-October to mid-April or greater than 2.1 inches during mid-April to mid-October. Direct construction away from areas with saturated soils and where drainage may concentrate until soils are no longer saturated, and limit vehicular traffic to established access roads. Where possible, leave existing vegetation root structure intact to enhance soil stability and infiltration capacity. Utilize best management practice (BMPs) such as low-ground-pressure and/or long-reach equipment, temporary matting and work pads, and localized engineered drainage improvements (e.g., interceptor drains, detention basins). Where soil compaction is observed to have occurred, decompact subsoils to a minimum depth of 18 inches or as identified in site reclamation plans and lease agreements.

[5] Geo-: Identifier of numbered mitigation item for Geology

Rationale: This mitigation measure limits erosion and disturbance of natural soil profiles.

In addition to the geology mitigation measure, the following measures developed for other chapters may be applicable to geology:

A-1:[6] Limit traffic speeds on unpaved areas to less than 15 miles per hour (mph), rather than the Applicant-proposed 25-mph limit.

Rationale: Access-road-related fugitive dust from construction vehicle traffic is the single largest source of emissions of particulate matter less than or equal to 10 microns in diameter (PM_{10}) and less than or equal to 2.5 microns in diameter ($PM_{2.5}$) from Project construction. Road-related fugitive dust emissions increase with increasing vehicle speed. Consequently, one of the BMPs for mitigation of road-related fugitive dust emissions is to limit vehicle speed. The Applicant has proposed to limit vehicle speed to 25 mph. A lower vehicle speed limit of 15 mph is feasible and would further reduce fugitive PM_{10} and $PM_{2.5}$ emissions.

W-2:[7] Minimize Work in Heavy Rain: Project construction and decommissioning would be minimized during rainy periods and heavy rain—in particular, work near ephemeral or intermittent streams.

Rationale: This mitigation measure addresses potential impacts of surface water and runoff and would minimize the risk of sediment release to surface water and wetlands.

Veg-7:[8] The Detailed Site Restoration Plan is a required, regulatory document. It would be prepared and submitted for approval by EFSEC for final revegetation prior to Project decommissioning for the temporary and permanent disturbance areas. It would be adapted to include modified habitat.

Rationale: The Detailed Site Restoration Plan would be a living document. It would include the methods, success criteria, monitoring, and reporting for revegetation at the end of the Project life. It would also include provisions for adaptive management and would be prepared based on any lessons learned from implementing the revegetation planned for the temporary disturbance from Project construction as described in Appendix N of the 2022 ASC (Appendix N, Horse Heave Wind Farm, LLC 2022).

LSU-4:[9] After construction is completed, the Applicant would restore all temporary disturbance areas to their preconstruction status.

Rationale: This mitigation measure would allow the areas of temporary disturbance within the Lease Boundary to return to their preconstruction agricultural production levels as soon as possible.

LSU-5: Prior to decommissioning, the Applicant would submit a Detailed Site Restoration Plan, per WAC 463-72-050, for restoring the site to its preconstruction character. The Applicant would be responsible for working with the landowner to return all agricultural land to its preconstruction status. If future site conditions or land ownership no longer allow for the land to be returned to agricultural production, the Applicant would submit a request to EFSEC for an alternative land use that would be in alignment with the Lease Boundary's preconstruction rural character and resource value. If the Detailed Site Restoration Plan

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[6] A-: Identifier of numbered mitigation item for Air

[7] W-: Identifier of numbered mitigation item for Water

[8] Veg-: Identifier of numbered mitigation item for Vegetation

[9] LSU-: Identifier of numbered mitigation item for Land and Shoreline Use

requests an alternative land use, EFSEC may require that the Applicant provide additional mitigation to offset impacts from a permanent conversion of the land.

Rationale: This mitigation measure would assist in preventing conversion of a land use that is not in alignment with the Lease Boundary's current designation.

4.2.2.8 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include the undergrounding of transmission lines, where applicable[9]

- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[10]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for earth resources in the Draft EIS, and the impact ratings remain the same.

4.2.2.9 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves its context and intensity, which, in turn, depend on the magnitude and duration of the impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This Environmental Impact Statement weighs the potential impacts on earth resources that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.2-4a, 4.2-4b, and 4.2-4c**. As shown in the impact summary tables for earth resources, EFSEC has determined that no significant unavoidable adverse impacts would occur.

[10] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

Table 4.2-4a: Summary of Potential Impacts on Earth Resources during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Geology (Landscape)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Adverse impacts on geology could occur from the installation of deep turbine foundations.	Low	Constant	Feasible	Limited	No mitigation identified	None identified
Geology (Landscape)	Solar Arrays	Subsurface construction activities would rarely encounter bedrock.	Low	Constant	Unlikely	Limited	No mitigation identified	None identified
Geology (Landscape)	BESS Substations	Subsurface construction activities would not be expected to encounter bedrock.	Low	Constant	Unlikely	Limited	No mitigation identified	None identified
Soils (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The disturbance to natural soil profiles could result in a temporary increase in localized soil erosion. These activities are likely to include site clearing, excavation, and backfilling. The construction and erection of turbine tower foundations would disturb soil resources as the contractor excavates unsuitable material from the Project area.	Low	Short term	Unavoidable	Confined	**Geo-1:** Avoid construction during wet periods **A-1:** Limit traffic speeds **Veg-7:** Detailed Site Restoration Plan **W-2:** Minimize work in heavy rain **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified
Topography (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction activities that would impact topography include excavation, grading, and cut-and-fill-slope development. Limited grading and/or placement of additional fill may be needed to obtain necessary grades for access roads, building foundations, and leveling the ground. Surface disturbance from construction-related activities would impact topography around each turbine.	Low	Short term	Unavoidable	Confined	**Geo-1:** Avoid construction during wet periods **A-1:** Limit traffic speeds **LSU-4:** Restoration of temporary disturbance to preconstruction status	None identified
Earthquakes (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Prolonged earthquake-induced ground shaking could cause minor damage to infrastructure if shaking has an intensity and duration that exceeds code-based structural seismic design levels.	Negligible	Temporary	Feasible	Confined	No mitigation identified	None identified

Table 4.2-4a: Summary of Potential Impacts on Earth Resources during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Landslide Hazards and Ground Instability (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The Project site includes areas susceptible to landslides and bluff failures. Existing ground instability, high rainfall rates, and strong earthquake shaking could cause landslides.	Low	Temporary	Unlikely	Limited	**Geo-1:** Avoid construction during wet periods **Veg-7:** Detailed Site Restoration Plan **W-2:** Minimize work in heavy rain **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified
Volcanic Activity (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Hazards from ashfall to construction activities would include the following: ▪ Accumulation of ash on structures ▪ Clogging of electronics, machinery, and filters ▪ Suspension of abrasive fine particles in air and water ▪ Accumulation of ash on transportation routes and vegetation	Negligible	Temporary	Unlikely	Confined	No mitigation identified	None identified

Notes:
(a) The impacts related to each component including “comprehensive Project” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = Battery energy storage system; EFSEC = Washington Energy Facility Siting Council.

Table 4.2-4b: Summary of Potential Impacts on Earth Resources during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Geology (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Impacts on the underlying basalt bedrock are not expected to include deep excavations that encounter geologic resources.	Negligible	Temporary	Feasible	Limited	No mitigation identified	None identified
Soils (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	It is anticipated that no new ground disturbance would occur. Access roads and cleared areas could be susceptible to increased soil erosion from a lack of stabilizing vegetation or hard cover and prior disturbance of the local soil profile. Soil erosion, because of operations, would be limited to gravel-surfaced areas, including the apron constructed around each turbine.	Low	Temporary	Feasible	Limited	**A-1:** Limit traffic speeds **Veg-7:** Detailed Site Restoration Plan **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified
Topography (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Facility operation would not require further excavation of existing ground surfaces or additional grading. Furthermore, it is anticipated that ground improvement techniques used during the construction stage would mitigate soils susceptible to erosion by improving their engineering performance and reducing their potential for settlement.	Negligible	Temporary	Unlikely	Limited	No mitigation identified	None identified
Earthquakes (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Prolonged earthquake ground shaking could cause minor damage to infrastructure if the intensity and duration of the shaking exceed code-based structural seismic design levels.	Low	Temporary	Feasible	Confined	No mitigation identified	None identified
Landslide Hazards and Ground Instability (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Existing ground instability, high rainfall rates, and strong earthquake shaking could cause landslides.	Low	Temporary	Unlikely	Limited	**Veg-7:** Detailed Site Restoration Plan **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified

Table 4.2-4b: Summary of Potential Impacts on Earth Resources during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Volcanic Activity (Safety)	Turbine Option 1 Turbine Option 2 BESS Substations	Hazards from ashfall to operational activities would include the following: ▪ Accumulation of ash on structures ▪ Clogging of electronics, machinery, and filters ▪ Suspension of abrasive fine particles in air and water ▪ Accumulation of ash on transportation routes and vegetation	Negligible	Temporary	Unlikely	Confined	No mitigation identified	None identified
Volcanic Activity (Safety)	Solar Arrays **Comprehensive Project**	Ashfall and ash accumulation have the potential to reduce the photovoltaic-generated power of the solar panel as well as damage the solar arrays' components	Low	Temporary	Unlikely	Limited	No mitigation identified	None identified

Notes:
(a) The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.2-4c: Summary of Potential Impacts on Earth Resources during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Geology (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The likelihood of a foundation removal encountering bedrock is low. If bedrock were to be impacted during the decommissioning stage, then it would likely have already been encountered during the construction stage.	Low	Temporary	Probable	Limited	No mitigation identified	None identified
Soils (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning activities associated with the Project could impact and disturb the soil profile, due to excavating foundations and utilities, removing unsealed areas, restoring the original ground profile, and rehabilitating vegetation.	Low	Short Term	Unavoidable	Limited	**Geo-1:** Avoid construction during wet periods **W-2:** Minimize work in heavy rain **Veg-7**: Detailed Site Restoration Plan **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified
Topography (Landscape)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The Applicant would restore the original topographic profile in areas of previous development.	Low	Short Term	Probable	Limited	**Geo-1:** Avoid construction during wet periods **W-2:** Minimize work in heavy rain **Veg-7**: Detailed Site Restoration Plan **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified
Earthquakes (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Prolonged earthquake ground shaking could cause minor damage to infrastructure if the intensity and duration of the shaking exceed structural seismic design levels.	Negligible	Temporary	Feasible	Confined	No mitigation identified	None identified
Landslide Hazards and Ground Instability (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Existing ground instability, high rainfall rates, and strong earthquake shaking could cause landslides.	Low	Temporary	Unlikely	Limited	**Geo-1:** Avoid construction during wet periods **W-2:** Minimize work in heavy rain **Veg-7**: Detailed Site Restoration Plan **LSU-4:** Restoration of temporary disturbance to preconstruction status **LSU-5:** Modified habitat included in the Detailed Site Restoration Plan	None identified

Table 4.2-4c: Summary of Potential Impacts on Earth Resources during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Volcanic Activity (Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Hazards from ashfall to decommissioning activities would include the following: ▪ Accumulation of ash on structures ▪ Clogging of electronics, machinery, and filters ▪ Suspension of abrasive fine particles in air and water ▪ Accumulation of ash on transportation routes and vegetation	Negligible	Temporary	Unlikely	Confined	No mitigation identified	None identified

Notes:
(a) The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

4.2.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to earth resources from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.3 Air Quality

This section describes the impacts on air quality that could result from the proposed Horse Heaven Wind Farm (Project, or Proposed Action) and under the No Action Alternative. Section 3.3 presents the affected environment for air quality. Potential impacts are assessed within the Lease Boundary and the Project vicinity, which includes the areas 4 miles south/southwest of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River.

Under the Washington State Environmental Policy Act, this Environmental Impact Statement (EIS) weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when evaluating potential impacts (WAC 197-11-330 and WAC 197-11-794). These impacts were qualitatively assessed based on the method of analysis described in Section 4.3.1. Additionally, the qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and summarized in **Table 4.3-1**.

Table 4.3-1: Impact Rating Table for Air Quality from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

As identified in **Table 4.3-2**, the determination of impact magnitude is based on relative quantity of emissions; compatibility with applicable air quality rules, regulations, and plans; and potential exposure to sensitive receptors.[11]

Table 4.3-2: Criteria for Assessing Magnitude of Impacts on Air Resources

Magnitude of Impact	Description
Negligible	**Quantity of Emissions:** Project emissions are extremely small or negligible in comparison to background regional emissions. **Compatibility with Applicable Rules, Regulations, and Plans:** The Project would comply with all applicable rules, regulations, and plans. **Potential Exposure to Sensitive Receptors:** No sensitive receptors are located near the site.
Low	**Quantity of Emissions:** Project emissions are low in comparison to background regional emissions. **Compatibility with Applicable Rules, Regulations, and Plans:** The Project is expected to comply with all applicable rules, regulations, and plans. Additional agency approvals may be required. **Potential Exposure to Sensitive Receptors:** Few sensitive receptors are located in close proximity to the site.
Medium	**Quantity of Emissions:** Project emissions are similar to background regional emissions, or would raise background regional emissions but not to a level that could cause adverse effects on human health **Compatibility with Applicable Rules, Regulations, and Plans:** The Project is expected to comply with all applicable rules, regulations, and plans. Additional agency approvals and mitigation may be required. **Potential Exposure to Sensitive Receptors:** More than a few sensitive receptors are located in close proximity to the site.
High	**Quantity of Emissions:** Project emissions are high in comparison to background regional emissions or would raise background emissions above regional air quality levels that would cause adverse human health effects **Compatibility with Applicable Rules, Regulations, and Plans:** The Project may comply with all applicable rules, regulations, and plans, but some changes to rules, regulations, or plans may be required to establish conformity. Additional agency approvals and mitigation are required. **Potential Exposure to Sensitive Receptors:** Many sensitive receptors are located in close proximity to the site.

Background

Potential impacts from the Proposed Action were assessed for air quality during Project construction, operations and maintenance, and decommissioning. Potential impacts from the construction, operation, and decommissioning of the various Project components, turbines, substations, solar arrays, and battery energy storage system (BESS) are considered collectively in this assessment. The construction of these components is

[11] Sensitive receptors are locations where particularly vulnerable persons reside for extended periods and include: day care centers, schools, nursing homes, hospitals and other similar facilities.

expected to occur concurrently; the same is true for the operation and decommissioning stages. Accordingly, the air quality impacts during each stage would result collectively from all equipment.

This evaluation includes Project emissions estimates for the construction and operation stages, including construction phasing and traffic estimates, that are presented in the 2022 Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2022). Although not explicitly estimated, decommissioning-stage emissions are expected to be comparable to or less than construction-stage emissions. This assessment of impacts on air quality from Project development is based on the following:

- Construction and operations emission calculations prepared by Horse Heaven Wind Farm, LLC (Applicant) (Horse Heaven Wind Farm, LLC 2021)
- Supplemental emission calculations for fugitive dust during construction (**Appendix 4.3-1**)
- Supplemental emission calculations and air quality dispersion modeling prepared by the Applicant (Tetra Tech 2023)
- Review of background climate, air quality, and regional emissions inventory data

4.3.1 Method of Analysis

For point sources of pollution, such as a stationary facility with emissions from physical stacks, air quality impacts are typically assessed using air quality dispersion computer models approved by the U.S. Environmental Protection Agency (EPA). The computer models are used to predict ambient air quality concentrations resulting from operation of specific point sources. Modeled air quality concentration impacts are added to existing background air quality levels to determine a predicted ambient air quality level (modeled impact from source + background air quality = predicted ambient air quality). This predicted ambient air quality level can be compared with applicable National Ambient Air Quality Standards (NAAQS) to determine whether a proposed source is expected to cause a violation of any NAAQS. Commonly used EPA-approved air quality dispersion models are generally based on:

- Steady-state emissions parameters that do not fluctuate in location, velocity or flow rate, temperature, or emission rate
- Meteorological data sets, generally obtainable from monitoring stations representative of site conditions, that include key parameters affecting dispersion such as wind speed, wind direction, atmospheric stability, and ambient temperature

For the Project, expected emissions would primarily result either from mobile equipment or from fugitive dust from disturbed surfaces that are not steady-state. In addition, the Applicant has proposed the use of a portable concrete batch plant and backup diesel-fired generators at fixed locations during construction. The anticipated emissions for mobile equipment and fugitive dust would vary in location, emission rate, and emission release patterns over time. Although such variations could be addressed by computer dispersion modeling, the underlying assumptions regarding specific locations, emission rate variations, and emission release parameter variations would be so speculative that there is no “representative” set of assumptions that could be made without undermining the validity of the modeling. The known stationary sources of emissions (concrete batch plant and backup generators), however, can be modeled. This dispersion modeling of Project emissions was not performed for the Draft EIS because the Applicant had not confirmed whether these sources would be a part of Project construction. However, the Applicant has subsequently clarified that a concrete batch plant and backup generators will be used to support construction. This section provides an updated air quality impact analysis based on computer dispersion modeling of concrete batch plant and emergency generator emissions, including a worst-case set of assumptions that captures the Applicant's desire for flexibility in overlapping construction activities.

Expected emissions from the mobile equipment and fugitive dust were calculated and compared to existing background regional (i.e., countywide) emissions using the most current regional emissions inventory. The Project was evaluated for conformity with applicable rules, regulations, and plans. The Project vicinity was also evaluated for the presence of nearby sensitive receptors. For the concrete batch plant and backup generators, dispersion modeling results were compared with representative background air quality conditions, as reported in Section 3.3, to determine whether the incremental addition of these sources to background air quality levels would potentially jeopardize attainment of ambient air quality standards.

The qualitative rating system described in Section 4.1 was used to assess the extent of air quality impacts according to the following attributes:

- Magnitude – Are quantities of emissions negligible, low, moderate, or high in comparison to existing background regional emissions? Are Project emissions compatible with applicable rules, regulations, and plans, or would additional agency approvals, mitigation or changes to applicable rules, regulations, or plans be needed to establish conformity? Are there sensitive receptors in close proximity that could be exposed to substantial quantities of air pollutants? Will modeled impacts of stationary sources associated with construction potentially jeopardize attainment of ambient air quality standards?
- Duration – Are emissions temporary, short term, long term, or constant, and would they continue beyond the life of the Project?
- Spatial Extent – Are emissions impacts confined to a very small area, do they extend throughout the entire Lease Boundary, do they extend beyond the Lease Boundary to nearby receptors, or are they regional in nature?
- Likelihood – Are emissions impacts unlikely, feasible, probable, or inevitable?

4.3.1.1 Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on air quality are discussed in Section 2.1.3 and summarized below.

- 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. Construction equipment that meets the EPA's Tier 4 emission standards for diesel engines would be used to the extent it is available (Horse Heaven Wind Farm, LLC 2021).
- 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.
- Construction materials that could be a source of fugitive dust would be covered when stored.
- Traffic speeds on unpaved roads would be limited to 25 miles per hour (mph) to minimize generation of fugitive dust.
- Truck beds would be covered when transporting dirt or soil.
- Construction workers would be encouraged to carpool to minimize construction-related traffic and associated emissions.
- Erosion-control measures would be implemented to limit deposition of silt to roadways and to minimize a vector for fugitive dust.
- Replanting or graveling disturbed areas would be conducted during and after construction to reduce windblown dust.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.3.2.6.

4.3.1.2 Example Phased Approach

This EIS considers the impact of the Project as a whole. To align with the impact rating system described by the Applicant's air quality impact analysis in the ASC, this evaluation of air quality analyzes potential impacts from the Proposed Action in the context of the Applicant's example of a phased approach to the expected overall approximately two-year construction schedule:

- Phase 1 construction could generate power via wind and solar energy. Phase 1 could also include a BESS capable of storing energy. Construction during Phase 1 would involve the use of a wide variety of mobile heavy construction equipment, vehicles and trucks, and fugitive dust associated with vehicular traffic and unpaved surfaces. In addition, Phase 1 would also include construction of the west substation and the use of a west laydown area. Emission sources at the west substation and west laydown would include a concrete batch plant with a maximum production rate of 330 tons per hour and 1,423 tons per day operating for four months to support production of concrete and the use of four diesel-fired backup power generators, three rated at 2,680 brake horsepower (bhp) and one rated at 670 bhp, each operating up to 500 hours (Tetra Tech 2023).
- Phase 2 construction is divided into Phase 2a and Phase 2b, summarized as follows:
  - Phase 2a could consist of the construction of both wind and solar facilities. The Applicant's Phase 2a scenario also includes the construction of a BESS.
  - Phase 2b could increase power generation via the construction of additional wind turbines, but construction would not include a BESS.

Phase 2 construction would similarly involve the use of a wide variety of mobile heavy construction equipment, vehicles and trucks and fugitive dust associated with vehicular traffic and unpaved surfaces. In addition, Phase 2 would also include construction of the east substation and the use of an east laydown area. Emission sources at the east substation and east laydown would include a concrete batch plant with a maximum production rate of 330 tons per hour and 1,423 tons per day operating for four months to support production of concrete and the use of four diesel-fired backup power generators, three rated at 2,680 bhp and one rated at 670 bhp, each operating up to 500 hours (Tetra Tech 2023).

Chapter 2 contains more information on the Applicant's example of a phased approach to construction. The construction schedule, including the phasing of specific elements of the Project, could alter the details of the analysis. Any construction traffic volume increases from combining the two phases are expected to be minimal and unlikely to affect the analysis for the phased approach.

Emissions during construction of Phase 1, Phase 2a, and Phase 2b were not anticipated to occur coincidentally and are reported separately, according to information supplied by the Applicant. Emission calculations for each phase of the Project were provided by the Applicant in a supplemental data response (Horse Heaven Wind Farm, LLC 2021) and are presented in **Table 4.3-3**, below. This table presents the total emissions associated with on-road and off-road fuel-burning equipment to be used during construction and operation, as well as estimated fugitive dust emissions during construction by overall Project phase. The Applicant did not provide estimates for emissions during Project decommissioning. It can be assumed that the decommissioning activities would be similar and no more intensive than the construction activities. Accordingly, the associated emissions during decommissioning would be no more than those presented for the construction activities. Emissions are also presented by calendar year during construction and operation of the Project. These emission estimates incorporate Applicant-proposed emission control measures presented in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022; Tetra Tech 2023).

Calculation details for each Project phase are provided in **Appendix 4.3-1** and **Appendix 4.3-2** and include:

- A listing of anticipated air-emitting equipment for each phase
- The assumed equipment ratings, load factors, and references for the emissions factors[12]
- Details regarding the emission sources associated with operation of the concrete batch plant and backup generators
- Other assumptions used in the calculations

The emissions factors used are presented in **Appendix 4.3-1** and **Appendix 4.3-2**. These appendices also provide construction schedules for each phase of the Project, as well as the types and quantities of equipment and other assumptions used for each specific task during construction, operation, and maintenance of the Project.

Emissions factors for non-road[13] mobile equipment to be used during construction of the Project were calculated using the current version of the EPA's Motor Vehicle Emission Simulator (MOVES) emissions factor modeling

[12] Emissions factors (EFs) are standardized factors developed for calculating emissions from different air pollutant-emitting activities. EFs are generally expressed in mass per unit of activity. Emissions are calculated by multiplying EF x units of activity. For example, motor vehicle EFs are frequently expressed in terms of gm/vehicle mile travelled (VMT). In this case VMT is the unit of activity. Total motor vehicle emissions are then calculated as follows: motor vehicle emissions (grams) = EF (grams/VMT) x VMT. EFs vary by pollutant and source category. In some instances, EFs vary by equipment ratings, load factors and other parameters. More specifics are contained in EPA (2016, 2021a, 2021b).

[13] The term "non-road" applies to any source equipment that is not a motor vehicle routinely operated on a highway or road. Examples of non-road mobile equipment relevant to the Project include graders, scrapers, excavators, trenchers, and many other types of off-highway mobile construction equipment. The term also includes airplanes, trains, ships, and other ocean or water-going vessels. The terms "non-road" and "off-road" are often used synonymously and interchangeably.

system (EPA 2021a). The current version of MOVES, known as MOVES3, is the EPA's accepted model for estimating mobile source emissions for both federal and state environmental assessments. MOVES analyses were conducted using default input files for Benton County provided by the Washington State Department of Ecology (Ecology) (Horse Heaven, LLC 2021). The analyses were conducted for two separate calendar years, 2023 and 2024, and were used to estimate emissions from the corresponding phase of construction occurring in each year[14] (Horse Heaven Wind Farm, LLC 2021).

Emissions for on-road mobile equipment to be used during construction, operation, and maintenance of the Project, including supply trucks, delivery vehicles, and worker commute vehicles, were also calculated using MOVES3 and the default input files for Benton County. The analyses were conducted for calendar years 2023 and 2024 and applied to the corresponding phase of construction occurring in each calendar year. The 2024 emissions factors were also used to estimate on-road vehicle emissions during operation and maintenance activities for calendar years 2025 and later (Horse Heaven Wind Farm, LLC 2021).

[14] 2023 emissions factors were used for Phase 1 construction emissions, and 2024 emissions factors were used for both Phase 2a and Phase 2b construction emissions.

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Table 4.3-3: Summary of Air Quality Emissions, tons per year

Emission Totals by Phase[a]	**VOCs**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**HAP**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Phase 1 Wind	3.03	24.66	17.83	1.34	1.29	0.03	0.40	9,094	0.29	0.17	9,150.72
Phase 1 Solar	2.12	14.67	9.94	1.15	1.11	0.02	0.39	4,794	0.16	0.10	4,827.91
Phase 1 Battery	0.27	2.29	1.42	0.12	0.11	0.00	0.03	806	0.03	0.01	811.34
Fugitive Dust	-	-	-	1,163.38	125.22	-	-	-	-	-	-
East Substation and Laydown Area	1.54	52.26	11.98	1.53	1.53	0.03	0.398	955.75	0.97	2.31	1,668.52
Phase 1 Total	**6.96**	**93.88**	**41.17**	**1,167.52**	**129.26**	**0.08**	**1.22**	**15,649.75**	**1.45**	**2.59**	**16,458.49**
Phase 2a Wind	3.47	29.48	18.44	1.68	1.62	0.04	0.53	11,199	0.33	0.22	11,272.03
Phase 2a Solar	1.92	13.23	8.75	1.05	1.01	0.01	0.36	4,547	0.15	0.10	4,579.36
Phase 2a Battery	0.25	2.12	1.27	0.11	0.11	0.00	0.03	797	0.03	0.01	802.14
Fugitive Dust	-	-	-	957.79	103.05	-	-	-	-	-	-
West Substation	1.42	48.24	11.06	1.41	1.41	0.02	0.37	764.49	0.78	1.85	1,334.62
West Laydown Area	0.92	4.02	0.92	0.12	0.12	0.00	0.31	191.26	0.19	0.46	33.90
Phase 2a Total	**7.98**	**97.09**	**40.44**	**962.16**	**107.32**	**0.07**	**1.60**	**17,498.75**	**1.48**	**2.64**	**18,022.05**
Phase 2b Wind	4.27	36.73	22.69	2.04	1.96	0.04	0.64	13,858	0.41	0.27	13,947.13
Fugitive Dust	-	-	-	963.97	109.19	-	-	-	-	-	-
West Substation	1.42	48.24	11.06	1.41	1.41	0.02	0.37	764.49	0.78	1.85	1,334.62
West Laydown Area	0.92	4.02	0.92	0.12	0.12	0.00	0.31	191.26	0.19	0.46	33.90
Phase 2b Total	**6.61**	**88.99**	**34.67**	**967.54**	**112.68**	**0.06**	**1.32**	**14,813.75**	**1.38**	**2.58**	**15,315.65**
O&M[b]	0.07	0.28	0.62	N	N	N	N	134.31	1.22×10^{-2}	1.00×10^{-3}	134.91
O&M Total[b]	**0.07**	**0.28**	**0.62**	**N**	**N**	**N**	**N**	**134.31**	**1.22×10^{-2}**	**1.00×10^{-3}**	**134.91**

Source: Horse Heaven Wind Farm 2021 and Tetra Tech 2023
"-" = no emissions; CH_4 = methane; CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; HAP = hazardous air pollutants; N = negligible; N_2O = nitrous oxide; NO_X = oxides of nitrogen; O&M = operations and maintenance; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Table 4.3-3: Summary of Air Quality Emissions, tons per year

Emission Totals by Calendar Year[(a)]	**VOCs**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**HAP**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
2023 (Phase 1)	6.96	93.88	41.17	1,167.52	129.26	0.08	1.22	15,649.75	1.45	2.59	16,458.49
2024 (Maximum of Phase 2a or 2b)	7.98	97.09	40.44	967.54	112.68	0.07	1.6	17,498.8	1.48	2.64	18,022.1
2025 and onward (O&M)[(b)]	0.07	0.28	0.62	N	N	N	N	134.31	1.22×10^{-2}	1.00×10^{-3}	134.91

Sources: **Appendix 4.3-1** and **Appendix 4.3-2**

Notes:

(a) Emissions from individual phase components wind, solar, and battery include fuel-burning on-road and off-road equipment only. Fugitive dust emissions calculated and reported separately

(b) An N in this row denotes negligible emissions (less than 0.01 tons per year)

CH_4 = methane; CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; HAP = hazardous air pollutants; N_2O = nitrous oxide; NO_X = oxides of nitrogen; O&M = operations and maintenance; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

For non-road equipment, MOVES3 produced emissions factors for volatile organic compounds (VOCs), oxides of nitrogen (NO_X), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), carbon dioxide (CO_2), and methane (CH_4) in units of grams per horsepower-hour. Emissions of nitrous oxide (N_2O) from non-road equipment used a default emissions factor of 0.26 grams of N_2O per gallon of fuel combusted (EPA 2016a). Emissions factors for hazardous air pollutant (HAP) compounds from non-road diesel equipment were based on Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory, Volume I - Methodology, October 7, 2003 (ERG 2003). Total emissions of greenhouse gases (GHG) (measured in tons of CO_2 equivalents, or CO_2e) were calculated by applying the appropriate global warming potential (GWP) factors from Title 40, Code of Federal Regulations, Part 98 to the estimated emissions of CO_2, CH_4, and N_2O.[15] The GWP factors for these GHGs are 1 for CO_2, 25 for CH_4, and 298 for N_2O.

For on-road vehicles, MOVES3 produced emissions factors for VOCs, NO_X, CO, PM_{10}, $PM_{2.5}$, SO_2, CO_2, CH_4, N_2O, and CO_2e measured in grams per vehicle mile traveled. Emissions factors for HAP compounds from on-road vehicles were not available from the MOVES3 analyses. HAP emissions from on-road vehicles used during construction, operation, and maintenance of the Project are presumed to be negligible based on the relatively small total emissions of other pollutants contributed by Project-related on-road vehicles.

The fugitive dust emissions estimates reported in **Table 4.3-3**, above, include estimated contributions from exposed surface windblown dust, access road traffic, bulldozing activities, and grading activities that are separated, calculated, and presented as a “fugitive dust emissions” sum. Emissions factors were calculated using methods outlined in the EPA’s Compilation of Air Pollutant Emissions Factors (AP-42) (EPA 2021b). This reference has been published since 1972 as the primary compilation of the EPA’s emissions factor information. It contains emissions factors and process information for more than 200 air pollution source categories. A source category is a specific industry sector or group of similar emitting sources. The emissions factors have been developed and compiled from source test data, material balance studies, and engineering estimates. Since the 1995 fifth edition, the EPA has published many supplements and updates, the entirety of which are available online. **Appendix 4.3-1** includes further details regarding the specific equations and assumptions that were used in this analysis. Traffic count, mileage, exposed acreage, and duration were all derived from information reported in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022) or the associated data responses (Horse Heaven Wind Farm, LLC 2021.)

Emissions of PM, PM_{10}, and $PM_{2.5}$ from the concrete batch plant individual source categories are estimated based on emission factors provided in the EPA’s AP-42 Compilation of Air Pollutant Emission Factors (EPA 2021b):

- Concrete batch plant – Sections 11.12, 11.19.2, and 13.2.4
- Paved roads – Section 13.2.1
- Unpaved surfaces – Section 13.2.2
- Wind erosion of active storage piles – Section 13.2.4

All backup generator emissions are estimated based on emission factors provided in the EPA’s AP-42 Compilation of Air Pollutant Emission Factors, Section 3.4 (Tetra Tech 2023), except GHG emission factors that

[15] GWP is a factor that relates the global warming potential of each substance to the mass of CO_2 that would create the equivalent amount of global warming. For example, CH_4 has 25 times the global warming potential of CO_2 and therefore has a GWP of 25. Since each GHG has its own unique GWP, standard convention is to multiply the mass emissions of each GHG by its respective GWP to determine and report total CO_2e from all GHG emissions rather than report the emission rates of GHGs with different GWPs separately.

are based on emission factors in Title 40 Code of Federal Regulations Part 98, Subpart C, Tables C-1 and C-2 and engine parameters provided by the Applicant.

4.3.2 Impacts of Proposed Action

4.3.2.1 Impacts during Construction

During construction, Project impacts would result from use of fuel-burning equipment to support construction, as well as fugitive dust associated with exposed surface windblown dust, access road traffic, bulldozing, and grading activities. In addition, a concrete batch plant would be used for four months during each phase of construction, and four diesel backup generators would operate to supply backup power for up to 500 hours in each phase. For each phase of the Project, these emissions are compared with the countywide emissions, as shown in **Table 4.3-4**. These emission estimates incorporate Applicant-proposed emission control measures presented in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022).

It should be noted that each Project phase includes several subcomponents—wind turbines, solar arrays, BESS, and associated substations. For the wind turbine portion of the Project, the Applicant is considering two wind turbine options. The information provided by the Applicant does not allow a detailed examination of the difference between Turbine Option 1 and Turbine Option 2. However, it is expected that air quality impacts would be similar for both options. **Table 4.3-3**, above, provides a breakdown of combustion equipment emissions for each of the Project subcomponents. It is not possible to provide a similar breakdown for fugitive emissions based on information contained in the ASC. Based on the relative emissions for each subcomponent, the largest contributor to overall construction emissions would be the wind turbines, followed by the solar arrays, followed by the BESS. However, since all subcomponents of the Project are expected to be constructed more or less concurrently, this analysis compares the totality of the Project's emissions to regional emissions. Emissions associated with each phase of construction differ slightly in amount but are of comparable magnitude in relation to emissions in the county (**Table 4.3-4**).

Table 4.3-4: Comparison of Project Construction Emissions to Countywide Emissions by Phase

Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs	CO_2e
Annual Countywide Emissions (tons per year)[(a)]	29,463	5,622	14,493	3,190	105.5	11,548	1.1×10^8 [(b)]
Phase 1 (tons per year)	**41.17**	**93.88**	**1,167.52**	**129.26**	**0.08**	**6.96**	**16,458.49**
% of County Annual Emissions	0.14%	1.67%	8.06%	4.05%	0.08%	0.06%	0.01%
Phase 2a (tons per year)	**40.44**	**97.09**	**962.16**	**107.32**	**0.07**	**7.98**	**18,022.05**
% of County Annual Emissions	0.14%	1.73%	6.64%	3.36%	0.07%	0.07%	0.02%
Phase 2b (tons per year)	**34.67**	**88.99**	**967.54**	**112.68**	**0.06**	**6.61**	**15,315.65**
% of County Annual Emissions	0.12%	1.58%	6.68%	3.53%	0.06%	0.06%	0.01%

Sources: Ecology 2020, n.d.; **Table 4.3-3**

Notes:

(a) Annual countywide emissions are for the year 2017 (the most recent year for which Ecology has published countywide)

(b) Ecology reported greenhouse gas emissions in CO_2e of 99.6 million metric tons for 2018 (the most recent year for which data are available) which is equivalent to 1.1×10^8 tons.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; Ecology = Washington State Department of Ecology; NO_X = oxides of nitrogen; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Emissions during Project construction are expected to comply with all applicable air quality rules, regulations, and plans.

Dispersion Modeling Assessment of Concrete Batch Plant and Stationary Backup Engines

The Applicant has proposed the use of a concrete batch plant and backup diesel generators to support the construction and commissioning process. In addition to incorporating the emissions from these sources in the overall comparison of Project emissions with countywide emissions, a dispersion modeling assessment has also been completed to assess the potential impacts on ambient air quality (Tetra Tech 2023) and is included as **Appendix 4.3-2**. The Applicant would be required to submit applications to the Washington Energy Facility Site Evaluation Council (EFSEC) for approval of these sources prior to implementation once final equipment has been selected. The Applicant's dispersion modeling assessment is represented as a worst-case scenario so that impacts from these sources are expected to be less than those presented in the assessment. In the unlikely event that the Applicant chooses to use equipment with a greater capacity or use rate than included in the air quality assessment, the Applicant would be required to submit a supplemental air quality assessment demonstrating compliance with applicable ambient air quality standards, as well as Benton Clean Air Agency (BCAA), Ecology, and EPA regulations. BCAA, serving as contractor to EFSEC (not as the permit-issuing agency), would likely review these applications and advise EFSEC regarding conformance with applicable air quality plans, policies, and regulations, as well as any recommended mitigation measures prior to receiving approval from EFSEC to include these additional Project components.

The ambient air quality dispersion modeling analysis for the Project was conducted using procedures specified in the EPA's Guideline on Air Quality Models (EPA 2017) and based on correspondence with Ecology. The dispersion modeling for the Project evaluated worst-case operating conditions to predict the appropriate maximum ambient air concentration for each pollutant and averaging period. The modeled cumulative impacts are added to ambient background concentrations, and the sum is compared to the NAAQS. The EPA establishes the NAAQS for the criteria air pollutants in accordance with the federal Clean Air Act (CAA) to protect public health and public welfare. Section 302(h) of the CAA defines "welfare" to include effects on soils, water, crops, wildlife, weather, economic values, and personal comfort and well-being, as well as damage to and deterioration of property. **Table 4.3-5** provides the NAAQS, as well as the modeling rank basis, as defined by the EPA, used for the assessment of the Project's compliance with the various criteria.

Table 4.3-5: National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS ($\mu g/m^3$)	Rank for NAAQS Assessment
$PM_{2.5}$	24-hour	35	H8H (5-year Average)
	Annual	12	H1H (5-year Average)
PM_{10}	24-hour	150	H6H over 5 years
CO	1-hour	40,000	H2H
	8-hour	10,000	H2H
NO_2	1-hour	188	H8H (5-year Average)
	Annual	100	H1H

Table 4.3-5: National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS ($\mu g/m^3$)	Rank for NAAQS Assessment
SO_2	3-hour	1,300	H2H (5-year Average)
	24-hour	365	H2H (5-year Average)
	Annual	80	H1H (5-year Average)

Source: Title 40 Code of Federal Regulations Part 50
$\mu g/m^3$ = micrograms per cubic meter; CO = carbon monoxide; H8H = highest eighth high; H1H = highest first high; H6H = highest sixth high; H2H = highest second high; NAAQS = National Ambient Air Quality Standards; NO_X = oxides of nitrogen; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide

Model Selection

The most recent version of the American Meteorological Society/EPA Regulatory Model (AERMOD) was used in this modeling analysis. AERMOD is the EPA's preferred near-field dispersion modeling system for a wide range of regulatory applications. The AERMOD modeling system includes four regulatory components: AERMOD, AERMAP (terrain processor), AERMET (meteorological processor), and BPIP Prime (building input processor) (EPA 2016b).

Meteorological Data For AERMOD

A five-year hourly meteorological data set for the period 2018 through 2022 was processed using AERMET to use for input to AERMOD based on recommendations from Ecology. The processed data consists of hourly surface observations of wind speed and direction collected at the Tri-Cities Airport in Pasco, Washington, and upper air data collected by the National Weather Service in Spokane, Washington. The meteorological data were collected approximately 15 miles northeast of the Lease Boundary. A wind rose plot depicting the frequencies of wind speed and direction for this meteorological data set is provided in Figure 3.3-3 in Section 3.3.

Emission Source and Other Input Parameters

Modeled emissions include the following sources:

- Backup diesel-fired power generators
- Concrete Batch Plant Affiliated Sources including:
  - Sand and Aggregate Delivery and Transfer
  - Cement Delivery and Weigh Hopper Loading
  - Truck Mix Loading
  - Paved Roads
  - Unpaved Roads
- Wind Erosion of Storage Areas
- Particulate matter emissions from all facility operations, including material storage and handling as well as combustion emissions from the concrete batch plant.

Emission sources and rates are described in detail in **Appendix 4.3-2**. For the purposes of PM_{10} and $PM_{2.5}$ dispersion modeling, the maximum 24-hour emission rates were modeled rather than the maximum 1-hour emission rates.

For CO and SO_2, the maximum 1-hour emission rates were modeled.

For NO_2, consistent with guidance on the modeling of intermittent sources (EPA 2011), annualized emission rates were modeled based on the assumption that each stationary engine would operate up to 500 hours per year (i.e., maximum 1-hour emission rate times 500/8760). NO_X emissions from the Project sources are released primarily in the form of nitric oxide (NO), and these emissions convert to NO_2 in the atmosphere. The NO_2 impact analysis utilized the EPA default guideline Tier 2 NO_X to NO_2 conversion rates (Ambient Ratio Method [ARM] and ARM2). The Tier 2 approaches assume that NO_X converts to NO_2 at a rate consistent with a conservative NO_2/NO_X ambient ratio.

The modeling did not impose an operational restriction on the time of day, days of the week, or months of the year. Even though emission sources will be phased and will operate intermittently, all sources were conservatively modeled as operating consistently over the entire year.

Emissions released through a stack or vent were modeled as point sources. Emissions from material handling operations (drop points) were modeled as volume sources. The haul roads were modeled as line sources. The front-end loader activity and the wind erosion emissions were modeled as area sources. Model input parameters for fugitive dust sources were based on guidance provided in the National Sand, Stone, and Gravel Association's Modeling Fugitive Dust Sources with AERMOD (NSSGA 2007). Detailed model inputs are provided in **Appendix 4.3-2**.

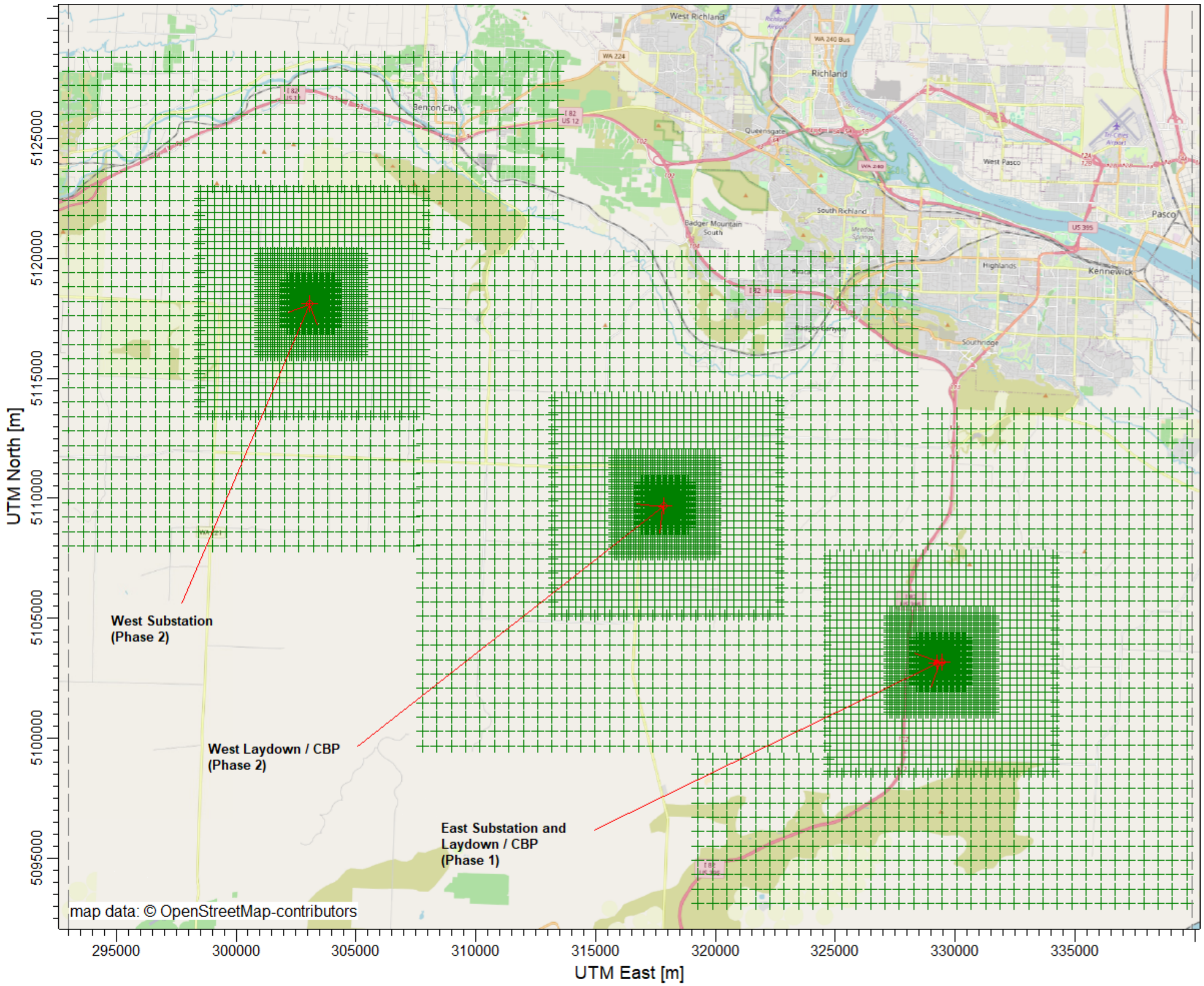
Source Configuration and Receptor Grids

As noted previously, the Project consists of two phases. Source groups were used to group activities related to each phase and to model associated emissions based on duration of each phase.

Discrete receptors are placed at intervals of 41 feet (12.5 meters) along the Project Lease Boundary fence line. The grid was extended out from the fence line at the following receptor intervals and distances:

- At 41-foot (12.5-meter) intervals from the Project site fence line to 492 feet (150 meters)
- At 82-foot (25-meter) intervals from 492 to 1,312 feet (150 to 400 meters)
- At 164-foot (50-meter) intervals from 1,312 to 2,953 feet (400 to 900 meters)
- At 328-foot (100-meter) intervals from 2,953 to 6,562 feet (900 to 2,000 meters)
- At 984-foot (300-meter) intervals from 6,562 to 14,764 feet (2,000 to 4,500 meters)
- At 1,969-foot (600-meter) intervals from 14,764 to 32,808 feet (4,500 to 10,000 meters)

The modeled receptor grid is shown in **Figure 4.3-1** and provides broad and adequate coverage of the Project vicinity. The dispersion model calculated air quality impacts at each receptor location (each cross-section within the grid). Figures 5-1a, 5-1b, and 5-1c of **Appendix 4.3-2** show the modeled source configurations.



Source: Tetra Tech 2023
Figure 4.3-1: Modeled Receptor Grid

Table 4.3-6 summarizes the results of the air quality modeling study performed for the concrete batch plant and emergency generator operations. Based on the modeling results, no violations of NAAQS are projected as a result of operation of these construction sources.

For PM_{10}, $PM_{2.5}$, and NO_2, the pollutants with impacts closest to the NAAQS, figures are provided in **Appendix 4.3-2** to indicate the approximate areas with the highest air quality impacts for these pollutants. These figures demonstrate that the highest air quality impacts are concentrated close to the source of emissions and are not widespread.

Table 4.3-6: Maximum AERMOD-Predicted Concentrations and NAAQS Compliance Assessment

Pollutant	Averaging Period	Rank Basis	Predicted Project Concentration ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS
$PM_{2.5}$	24-hour	H8H (5-year Average)	16.9	17.5	34	35
	Annual	H1H (5-year Average)	4.2	5.7	10	12
PM_{10}	24-Hour	H6H (5-year Duration)	59.8	71.6	131	150
CO	1-hour	H2H	624.9	1,386	2,011	40,000
	8-hour	H2H	445.3	962	1,407	10,000
NO_2	1-hour	H8H (5-year Average)	105.6	19.0	125	188
	Annual	H1H	6.9	3.8	11	100
SO_2	1-hour	H4H (5-year Average)	1.1	12.8	14	196
	3-hour	H2H	1.3	17.0	18	1,300
	24-hour	H2H	0.6	5.8	6	365
	Annual	H1H	0.07	1.0	1	80

Source: **Appendix 4.3-2** (Tetra Tech 2023)
$\mu g/m^3$ = micrograms per cubic meter; CO = carbon monoxide; H1H = highest first high; H2H = highest second high; H4H = highest fourth high; H6H = highest sixth high; H8H = highest eighth high; NAAQS = National Ambient Air Quality Standards; NO_X = oxides of nitrogen; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide

The results presented in **Table 4.3-4** and **Table 4.3-6** are discussed in the context of the impact rating system as follows:

- **Magnitude** – Quantities of emissions of CO, NO_X, SO_2, and VOCs, as well as GHG emissions (CO_2e), are considered negligible in the context of regional emissions, given that the expected emissions of each pollutant are less than 1 percent of regional emissions. Emissions of PM_{10} and $PM_{2.5}$, on the other hand, would exceed 5 and 1 percent, respectively, of regional emissions and would be considered low. In addition, air quality modeling of stationary sources associated with Project construction indicate no exceedances of NAAQS. The Project's estimated emissions and associated air quality impacts are expected to comply with all applicable rules, regulations, and plans. No sensitive receptors are located in close proximity to the Project or will be exposed to air quality exceeding applicable NAAQS. As a result, the Project is expected to have a low-magnitude impact on air quality during construction.

- **Duration** – Construction emissions would occur only during construction and are considered short term. Once the construction period ends, emissions for all pollutants would drop to negligible quantities, as noted in Section 4.3.2.2. Since ambient air quality for CO, NO_X, and SO_2 are well below applicable NAAQS, short-term emissions are small in comparison to regional emissions, they are unlikely to contribute to levels that would result in a violation of an applicable NAAQS. Ozone, PM_{10}, and $PM_{2.5}$ ambient levels have less margin relative to the NAAQS and are therefore discussed further below with respect to duration.
  - **Ozone** – The area has exhibited periodic short-term (1-hour average) ozone levels above 70 parts per billion (ppb) in recent years, but there are no 1-hour ozone NAAQS. There have been no exceedances of the 8-hour average ozone NAAQS, but the area is currently considered unclassifiable.[16] Ozone tends to build up during high ambient temperatures (greater than 85 degrees Fahrenheit) and low to moderate (less than 6 mph) north to northeast winds, conditions that are infrequent based on the wind rose shown in Section 3.3 (WSU 2017). These conditions are expected to persist for only a limited portion of the construction period. Ozone would not be directly emitted by the Project, but rather potentially formed in the atmosphere over time from emissions of other precursor pollutants (predominantly NO_X and VOCs). As noted in the discussion of emissions quantities above, ozone precursor emissions reflect a very small portion (less than 1 percent) of area-wide emissions and are therefore unlikely to contribute measurably to lasting, elevated ozone levels that would jeopardize attainment status.
  - **PM_{10} and $PM_{2.5}$** – The nearest ambient air quality monitor experienced high PM_{10} in 2019, but these periods have been associated with extreme events (wildfires). This drove the three-year average above the NAAQS, but concentrations dropped in 2020 and the area continues to be considered in attainment. Twenty-four-hour average $PM_{2.5}$ levels at the nearest monitor have been observed to be above the standard in recent years but, when considered in the context of data collected at other regional monitors, continue to result in the area being considered in attainment.[17] Air quality background data for the period 2014–2017 has been recommended by Ecology for use in ambient air quality impact assessments (Tetra Tech 2023). Background data for this recommended evaluation period indicate ambient levels that are well below applicable NAAQS. Emissions during construction would be temporary and not continuous.

[16] An EPA designation of "attainment" signifies that the EPA has formally determined that ambient air quality in an area complies with the applicable NAAQS, meaning that ambient air quality is better than the standards established to protect public health and welfare. Conversely, an EPA designation of "nonattainment" signifies that the EPA has formally determined that ambient air quality in an area fails to meet the applicable NAAQS. Areas that are designated "unclassifiable" do not possess sufficient air quality data to support a formal designation. Benton County is designated "unclassifiable/attainment" for the 2008 8-hour ozone standard and "unclassifiable" for the lower 2015 8-hour ozone standard because there are insufficient monitoring data to support a formal "attainment" or "nonattainment" designation.

[17] Benton County PM_{10} and $PM_{2.5}$ ambient air quality is considered "in attainment" because the majority of ambient air quality data from the nearest air quality monitors (excepting poor air quality events associated with extreme wildfires events that have been excluded by EPA) are better than the applicable NAAQS. The area has been formally designated "attainment/unclassifiable" meaning it is considered in attainment with the NAAQS but is "unclassifiable" because there are insufficient monitoring data to support a formal "attainment" designation.

The Applicant has proposed a number of PM_{10} and $PM_{2.5}$ emissions controls that would further reduce already low emissions. Air quality modeling performed for stationary sources associated with construction indicates no NAAQS violations. As a result of the short duration and temporary nature of Project construction emissions, and the control measures proposed by the Applicant, these emissions are not expected to cause a violation of NAAQS or attainment status.

- **Likelihood** – The Applicant has committed to a variety of best management practices (BMPs) that would minimize the occurrence of dust, including periodically applying water to stabilize exposed surfaces and limiting vehicle speed to reduce surface disturbance. These BMPs should adequately control fugitive dust in most instances, but, under very high winds, some temporary fugitive dust emissions would be feasible. Emissions associated with all pollutants are considered probable, but, with the implementation of BMPs, no violations of ambient air quality standards are likely to occur.
- **Spatial Extent** – Construction-related gaseous emissions from combustion would largely impact areas within the Lease Boundary. Temporary visible fugitive dust tends to fall out rapidly and within a few 100 yards of the source. It consists primarily of particles that are larger than PM_{10} that do not influence regional air quality. However, PM_{10} and $PM_{2.5}$ components of fugitive dust (not generally visible to the naked eye) could remain suspended in the air for greater distances. Fugitive dust emissions are generally temporary or short-term events that do not usually persist at a sustained rate over extended periods of time, such as a full 24-hour period, the shortest averaging time for which ambient air quality standards have been established. Over a 24-hour period, PM_{10} and $PM_{2.5}$ emissions would likely be dispersed rapidly with distance from the source such that average ambient air quality impacts over a full 24-hour period at nearby residential receptors would be considered confined. The air quality impact assessment included in **Appendix 4.3-2** provides several figures demonstrating that the spatial extent of maximum impacts is confined to an area within several hundred yards of construction stationary sources. All other air pollutant impacts are considered confined.

Based on the above, impacts are considered low, short term, probable, and confined.

4.3.2.2 Impacts during Operation

During operation, the Project would have air quality impacts associated primarily with the use of air conditioning equipment (minor GHG emissions only), maintenance vehicles, and fugitive dust that could occur from the use of access roads. These emissions are summarized in **Table 4.3-7** in comparison to countywide emissions and incorporate Applicant-proposed emission control measures presented in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022). Emissions of each pollutant are extremely small, representing much less than 0.01 percent of regional emissions.

Table 4.3-7: Comparison of Project Operations and Maintenance Emissions and Countywide Emissions

Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs	CO_2e
Countywide Emissions (tons per year)[(a)]	29,463	5,622	14,493	3,190	105.5	11,548	$1.1E \times 10^{8}$ [(b)]
Project O&M (tons per year)	0.62	0.28	9.43E-03	8.65E-04	5.46E-04	7.00E-02	135
% of County Annual Emissions	0.002%	0.005%	0.0001%	0.00003%	0.001%	0.001%	0.0001%

Sources: Ecology 2020, n.d.; Horse Heaven Wind Farm, LLC 2021

Notes:

(a) Countywide emissions are for the year 2017 (the most recent year for which Ecology has published countywide)

(b) Ecology reported greenhouse gas emissions in CO_2e of 99.6 million metric tons for 2018 (the most recent year for which data are available) which is equivalent to 1.1×10^8 tons.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; Ecology = Washington State Department of Ecology; NO_X = oxides of nitrogen; O&M = operations and maintenance; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

The results presented in **Table 4.37** are discussed in the context of the adopted impact rating system below:

- **Magnitude** – All air pollutant emissions combined would account for less than 0.01 percent of regional emissions, would be indistinguishable from background activities at these levels, and are considered negligible. The Project's estimated emissions are expected to comply with all applicable rules, regulations, and plans. No sensitive receptors are located in close proximity to the Project. As a result, the Project would be expected to have a negligible magnitude air quality impact during operation.
- **Duration** – Emissions would persist throughout the operation stage of the Project but would be short term in nature in that they would occur intermittently and only when maintenance vehicles are in use. Although the area has experienced brief periods of high PM_{10}, these periods have been associated with extreme events (wildfires) that are not expected to jeopardize attainment status. Similarly, $PM_{2.5}$ ambient air quality has been observed in multiple years above the 24-hour NAAQS at the nearest monitor, but when viewed in the context of other available regional monitoring, the area continues to be considered in attainment. Emissions during operations would be short term and not continuous. They would not be expected to result in a noticeable change in the area's ambient air quality or attainment status.
- **Likelihood** – The Applicant has committed to a variety of BMPs. These BMPs should adequately control fugitive dust in most instances, but under very high winds, some temporary fugitive dust emissions would be possible.
- **Spatial Extent** – Gaseous emissions from combustion of fuel in maintenance vehicles would be limited to access roads within the Lease Boundary.

Based on the above, impacts are considered negligible, short term, probable, and limited.

4.3.2.3 Impacts during Decommissioning

Due to the limited information available regarding decommissioning activities for the Project, emission rates during this period are not specifically calculated or modeled. The primary sources of emissions during decommissioning would be the transportation of workers and material to and from the site, use of off-road construction equipment to dismantle and remove foundations and equipment, and some surface disturbance (not as extensive as the grading activity required for construction) to support revegetation. It can therefore be expected that impacts from emissions would be somewhat less than those calculated for construction, but greater than those calculated for operation and incorporate Applicant-proposed emission control measures presented in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022).

Based on the above, impacts during decommissioning are expected to be low, short term, probable, and confined.

4.3.2.4 Greenhouse Gas Emissions and Impact

GHG emissions are of potential concern because they have been widely associated with the increasingly observable adverse effects of global climate change. Emissions of GHGs associated with construction, operation, and decommissioning are expected to be negligible in comparison with countywide GHG emissions (see **Tables 4.3-4 and 4.3-7**). Although a life cycle assessment of GHGs has not been conducted for the Project, a substantial range of life cycle GHG emissions has been reported in the literature. In 2021, the U.S. Department of Energy National Renewable Energy Laboratory published a comprehensive review and comparison of life cycle analyses of GHG emissions from electric generation (NREL 2021). The evaluation indicates that median reported life cycle GHG emissions from wind and solar photovoltaic electric generation, 13 and 43 grams of carbon dioxide equivalent per kilowatt hour (g CO_2e/kWh), respectively, are more than an order of magnitude lower than median reported life cycle GHG emissions from natural gas, oil, or coal-based generation (486, 830 and 1001 g CO_2/kWh) and comparable to median life cycle emissions from nuclear and hydropower of 13 and 27 g CO_2e/kWh, respectively. Natural gas, nonhydroelectric renewable resources (mostly wind), nuclear energy, and coal generate almost all the rest of Washington's in-state electricity. Natural gas is the second-largest source of in-state net generation, and it fueled 12 percent of the state's total electricity generation in 2020 (EIA 2023). To the extent that the Project is expected to displace natural gas fired generation, it is expected to have a net positive effect in displacing GHG emissions with greater GHG footprints. As a result, the Project is expected to have a negligible to net positive impact on statewide and global GHG emissions.

4.3.2.5 Recommended Mitigation Measures

EFSEC has identified the following mitigation measures for the Project to avoid and/or minimize potential impacts on air quality:

A-1:[18] Limit traffic speeds on unpaved areas to less than 15 mph rather than the Applicant-proposed 25-mph limit. Access-road-related fugitive dust from construction vehicle traffic is the single largest source of PM_{10} and $PM_{2.5}$ emissions from Project construction.

Rationale: Road-related fugitive dust emissions increase with increasing vehicle speed. Consequently, one of the BMPs for mitigation of road-related fugitive dust emissions is to limit vehicle speed. The Applicant has proposed to limit vehicle speed to 25 mph. A lower vehicle speed limit of 15 mph is feasible and would further reduce fugitive PM_{10} and $PM_{2.5}$ emissions.

A-2: Applicant shall submit a Proof of Contact: Soil Destabilization Notification to EFSEC at least 90 days prior to commencement of construction.

Rationale: Fugitive dust emissions are a potential concern. This notification will facilitate EFSEC awareness of commencement construction so that compliance with implementation of all Applicant-proposed BMPs can be field validated.

[18] A-: Identifier of numbered mitigation item for Air

4.3.2.6 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[19]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary

[19] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the 2022 ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for air quality in the Draft EIS, and impact ratings remain the same.

4.3.2.7 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This EIS weighs the impacts on air quality that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.3-8a, 4.3-8b, and 4.3-8c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to air quality.

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Table 4.3-8a: Summary of Potential Impacts on Air Resources during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Air Quality (Quantity of Emissions, Compatibility with Applicable Rules, Regulations, and Plans, Potential Exposure to Sensitive Receptors)	**Comprehensive Project**	Adverse impacts on air quality may occur from $PM_{2.5}$, PM_{10}, and fugitive dust during construction.	Low	Short Term	Probable	Confined	**A-1:** Limit speeds to less than 15 mph on dirt roads.	None identified

Notes:
(a) Impacts evaluated for the comprehensive Project since emissions from individual components within each phase will occur concurrently.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
EFSEC = Washington Energy Facility Site Evaluation Council; mph = miles per hour; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter

Table 4.3-8b: Summary of Potential Impacts on Air Resources during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Air Quality (Quantity of Emissions, Compatibility with Applicable Rules, Regulations, and Plans, Potential Exposure to Sensitive Receptors)	**Comprehensive Project**	Adverse impacts on air quality may result from operation and maintenance activities (primarily vehicular emissions)	Negligible	Short Term	Probable	Limited	**A-1:** Limit speeds to less than 15 mph on dirt roads.	None identified

Notes:
(a) Impacts evaluated for the comprehensive Project since emissions from individual components within each phase will occur concurrently.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
EFSEC = Washington Energy Facility Site Evaluation Council; mph = miles per hour

Table 4.3-8c: Summary of Potential Impacts on Air Resources during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Air Quality (Quantity of Emissions, Compatibility with Applicable Rules, Regulations, and Plans, Potential Exposure to Sensitive Receptors)	**Comprehensive Project**	Adverse impacts on air quality may occur during decommissioning from $PM_{2.5}$, PM_{10}, and fugitive dust	Low	Short Term	Probable	Confined	**A-1:** Limit speeds to less than 15 mph on dirt roads.	None identified

Notes:
(a) Impacts evaluated for the comprehensive Project since emissions from individual components within each phase will occur concurrently.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
EFSEC = Washington Energy Facility Site Evaluation Council; mph = miles per hour; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter

4.3.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to air quality from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.4 Water Resources

This section describes the potential impacts on water resources, identified in Section 3.4, that could result from the construction, operation, and decommissioning of the proposed Horse Heaven Wind Farm (Project, or Proposed Action), as well as from the No Action Alternative. This evaluation addresses the following water resources:

- Surface water and wetlands
- Runoff and absorption
- Floodplains
- Groundwater
- Public water supply

The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and shown in **Table 4.4-1**.

Table 4.4-1: Impact Rating Table for Water Resources from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

As identified in **Table 4.4-2**, the determination of impact magnitude is based on the Project's anticipated impacts on water resources, including impacts on surface water and wetlands, floodplains, groundwater, and public water supply. Impacts are quantified, where available, to assess their magnitude. Where impacts are not quantifiable, the magnitude of impact is determined based on change relative to existing conditions. The identified ratings have been included to further define magnitude in each case.

The magnitude of impacts for runoff and absorption was determined qualitatively using information on changes to impervious surfaces, mitigation measures, and the anticipated flow control of mitigation measures based on best management practices (BMPs) (Ecology 2019).

Table 4.4-2: Criteria for Assessing Magnitude of Impacts on Water Resources

Magnitude of Impacts	Description
Negligible	**Surface Water and Wetlands:** The Project would avoid impacts to surface water and wetlands or impacts would be indistinguishable from existing conditions. **Runoff/Absorption:** The Project would avoid impacts to runoff/absorption capacity or impacts would be indistinguishable from existing conditions. **Floodplains:** The Project would avoid impacts to floodplains or impacts would be indistinguishable from existing conditions. **Groundwater:** The Project would avoid impacts to groundwater or impacts would be indistinguishable from existing conditions. **Public Water Supply:** The Project would avoid impacts to public water supply or impacts would be indistinguishable from existing conditions.
Low	**Surface Water and Wetlands:** The Project would have minor impacts on surface water and wetlands. This may be temporary work within ephemeral streams. Impacts would be distinguishable from current conditions but are not anticipated to affect ecological function of surface water or wetlands. **Runoff/Absorption:** The Project would have minor impacts on runoff/absorption capacity. This may be a minor increase in impervious surface. Impacts would be distinguishable from current conditions but are not anticipated to affect ecological function. **Floodplains:** The Project would have minor impacts on floodplains. Impacts would be distinguishable from current conditions but are not anticipated to affect ecological function of floodplains. **Groundwater:** The Project would have minor impacts on groundwater. Impacts would be distinguishable from current conditions but are not anticipated to affect ecological function. **Public Water Supply:** The Project would have minor impacts on public water supply. Impacts would be distinguishable from current conditions but are not anticipated to affect public access.

Table 4.4-2: Criteria for Assessing Magnitude of Impacts on Water Resources

Magnitude of Impacts	Description
Medium	**Surface Water and Wetlands:** The Project would have moderate impacts on surface water and wetlands from disturbance. Ecological functions of surface water and wetlands are anticipated to be largely maintained but may be compromised at certain points during the year. **Runoff/Absorption:** The Project would have moderate impacts on runoff/absorption from disturbance. Ecological functions of runoff/absorption are anticipated to be largely maintained but may be compromised at certain points during the year. **Floodplains:** The Project would have moderate impacts on floodplain from disturbance. Ecological functions of floodplain are anticipated to be largely maintained but may be compromised at certain points during the year. **Groundwater:** The Project would have moderate impacts on groundwater from disturbance. Ecological functions of groundwater are anticipated to be largely maintained but may be compromised at certain points during the year. **Public Water Supply:** The Project would have moderate impacts on public water supply from disturbance. Public access to water supply is anticipated to be largely maintained but may be compromised at certain points during the year.
High	**Surface Water and Wetlands:** The Project would have major impacts on surface water and wetlands and would result in permanent alterations. Surface water and wetlands would be greatly altered from the current condition, and ecological functions provided by surface water and wetlands are anticipated to be lost or degraded. **Runoff/Absorption:** The Project would have major impacts on runoff/absorption and would result in permanent alterations. Runoff/absorption would be greatly altered from the current condition, and ecological functions are anticipated to be lost or degraded. **Floodplains:** The Project would have major impacts on floodplains and would result in permanent alterations. Floodplains would be greatly altered from the current condition, and ecological functions are anticipated to be lost or degraded. **Groundwater:** The Project would have major impacts on groundwater and would result in permanent alterations. Groundwater would be greatly altered from the current condition, and ecological functions are anticipated to be lost or degraded. **Public Water Supply:** The Project would have major impacts on public water supply and would result in permanent alterations. Public water supply would be greatly altered from the current condition and degraded.

4.4.1 Method of Analysis

The impacts on water resources from Project components and activities are assessed for the construction, operation, and decommissioning stages within the Lease Boundary. Laws and regulations for determining potential impacts on water resources are summarized in Section 3.4, Table 3.4-1.

Where available from the Application for Site Certification (ASC) for the Project, the potential for impacts on each of the water resources were quantified using measurable parameters. For example, impacts on surface water were determined for Project components by examining the number of streams impacted by temporary and permanent disturbance. However, for all impacts on water resources, a qualitative analysis was completed as described in Section 4.1.

Applicant Commitments

Horse Heaven Wind Farm, LLC (Applicant) has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC and taken into consideration in the characterization of potential impacts on water resources are discussed in Section 2.1.3 and summarized below (Horse Heaven Wind Farm, LLC 2022).

Applicant commitments are provided below and would be applied to the Project (Horse Heaven Wind Farm, LLC 2022).

- Disturbance would only occur within the Wind Energy Micrositing Corridors and Solar Siting Areas proposed in the ASC and would not total more than 2,957 acres of temporary disturbance and 6,869 acres of permanent disturbance. The Micrositing Corridors and Solar Siting Areas are larger than the Project's final footprint to allow minor rerouting to optimize the design and to avoid natural environmental resources that may be discovered during the final design and preconstruction process.
- The design of the Project components avoids all direct impacts on wetlands through refinements of the footprint design of the Micrositing Corridor and Solar Siting Areas. One wetland was identified within the Lease Boundary, located approximately 240 feet from the Micrositing Corridor. The wetland is rated as a Category IV Wetland, and Benton Country Code Chapter 15.04 Wetlands would typically require a 40-foot standard buffer around the wetland for proposed work (Benton County 2018). As the Micrositing Corridor is well beyond the required buffer, disturbance of the wetland would be avoided.
- The Project layout has been altered through iterations to site turbines being located a greater distance from the Columbia River.
- Impacts on waters of the state may be avoided by spanning (e.g., with the transmission line) or otherwise micrositing away from the streams. If these impacts cannot be avoided, indirect impacts on water quality will be minimized by working within the ordinary high water line during the dry season when no rain is predicted.
- The Applicant, through design of the Project components, would avoid permanent disturbance impacts on areas in 100-year flood zones/Frequently Flooded Area and alluvial soils associated with Critical Aquifer Recharge Areas (CARA). No permanent disturbance would occur in these areas.
- The Project would be constructed in a phased approach, with completed areas revegetated following completion of construction.
- The Project would comply with the National Pollutant Discharge Elimination System through adherence to a Construction Stormwater General Permit from the Washington State Department of Ecology (Ecology). Erosion and surface water runoff during construction and operation would comply with the Construction Stormwater General Permit.
- Water conservation would be implemented to the extent practicable by use of less water-intensive methods of dust suppression when possible, including use of soil stabilizers, tightly phasing construction activities, staging grading and other dust-creating activities, and/or compressing the entire construction schedule to reduce the time period over which dust suppression measures would be required.
- A Temporary Erosion and Sediment Control (TESC) plan would be developed and implemented in accordance with the Stormwater Management Manual for Eastern Washington, detailing specific best

management practices (BMPs) that would be used and where they would be placed, as well as the total disturbance area. The TESC plan would include measures to prevent erosion, contain sediment, and control drainage. The TESC plan would also include installation details of the BMPs, as well as notes, as required by the Stormwater Management Manual for Eastern Washington.

- A Stormwater Pollution Prevention Plan (SWPPP) meeting the conditions of the Construction Stormwater General Permit for Construction Activities would be prepared and implemented prior to construction and again during decommissioning. The SWPPP would detail the activities and conditions at the site that could cause water pollution, and the steps the facility would take to prevent the discharge of any unpermitted pollution. All final designs would comply with the Stormwater Management Manual for Eastern Washington (Ecology 2019). The SWPPP would include the following 13 elements specified in the manual:

  1. Preserve Vegetation/Mark Clearing Limits
  2. Establish Construction Access
  3. Control Flow Rates
  4. Install Sediment Controls
  5. Stabilize Soils
  6. Protect Slopes
  7. Protect Drain Inlets
  8. Stabilize Channels and Outlets
  9. Control Pollutants
  10. Control Dewatering
  11. Maintain BMPs
  12. Manage the Project
  13. Protect Low Impact Development BMPs (Infiltration BMPs) (Ecology 2019)

- All final designs would conform to the applicable Stormwater Management Manual.
- To control erosion and surface-water runoff during construction and operations, the Applicant will prepare a Construction Stormwater General Permit including a TESC plan. Water runoff from the Project will be contained by measures identified in the TESC plan to prevent erosion, contain sediment, and control drainage. The TESC plan will also include installation details of BMPs to be implemented.
- The 0.8-acre of temporary disturbance to the 100-year floodplain is related to the temporary disturbance footprint associated with the new 230 kilovolt (kV) transmission line for the solar intertie. The estimate is based on a standard disturbance width applied along all transmission line corridors but would be modified during final design to reduce impacts as much as possible.[20]

[20] No permanent features would be placed in the 100-year floodplain.

- Stabilized construction entrance and exit areas would be installed at locations where construction vehicles would access newly constructed roads, and/or require access to disturbed areas from paved roads. The stabilized construction entrance and exit areas would be inspected and maintained for the duration of the Project's lifespan.
- Clearing, excavation, and grading would be limited to areas of the Project area absolutely necessary for construction of the Project. Areas outside the construction limits would be marked in the field, and equipment would not be allowed to enter these areas or disturb existing vegetation. To the extent practicable, existing vegetation would be preserved. Where vegetation clearing is necessary, root systems would be conserved if possible.
- Excavated soil and rock from grading would be spread across the site to the natural grade and would be reseeded with native grasses to control erosion by water and wind.
- Silt fencing would be installed throughout the Project area as a perimeter control, including on the contour downgradient of excavations, around the operation and maintenance (O&M) facilities, and around the substations.
- Straw wattles would be used to decrease the velocity of sheet flow stormwater to prevent erosion. Wattles would be used along the downgradient edge of access roads adjacent to slopes or sensitive areas.
- Mulch would be used to immediately stabilize areas of soil disturbance, and during reseeding efforts.
- Jute matting, straw matting, or turf reinforcement matting would be used in conjunction with mulching to stabilize steep slopes that were exposed during access road installation.
- Soil binders and tackifiers would be used on exposed slopes to stabilize them until vegetation is established.
- Concrete chutes and trucks would be washed out in dedicated areas near the foundation construction locations. This practice would prevent concrete washout water from leaving a localized area. Soil excavated for the concrete washout area would be used as backfill for the completed footing to ensure that the surface soils maintain infiltration capacity.
- Effluent discharge from concrete works, including on-site concrete batch plant operations, would be controlled as required by the Construction Stormwater General Permit and the Sand and Gravel General Permit to prevent contamination of stormwater runoff. BMPs used (including, but not limited to, Stormwater Management Manual for Eastern Washington BMPs C151E, C154E, and C252E) would include preferential off-site disposal where possible, establishment and maintenance of concrete washout areas when off-site disposal is not possible and monitoring of effluent pH. Specific to operation of an on-site concrete batch plant, any impoundments for process water would be lined and the impoundment capacity adequate to provide treatment and flow control.
- Because the overall Project would meet the Construction Stormwater General Permit's definition of "significant concrete work" (i.e., greater than 1,000 cubic yards of concrete placed or poured), pH sampling would be completed as specified in the permit. If effluent exceeds the benchmark value, the high pH water would be either prevented from reaching surface water or neutralized. Site BMPs would be designed and implemented to avoid comingling of water, and any stormwater that has comingled with concrete wastewater would be considered process wastewater and managed appropriately. Additional sampling and monitoring

requirements are identified in the Sand and Gravel General Permit guidance document, and these requirements would be followed (Ecology 1999).

- The Site Management Plan would include all required elements, including the site map, TESC plan, Monitoring Plan, SWPPP, and Spill Prevention, Control, and Countermeasure (SPCC) Plan.
- An SPCC Plan would be prepared to prevent discharge of oil into navigable waters.
- To facilitate installation of the wind turbine generator footings, large excavations would be created. Soil from these excavations would be temporarily stockpiled and used as backfill for the completed footing. Silt fencing would be installed around the stockpiled material as a perimeter control. Mulch or plastic sheeting would be used to cover the stockpiled material. Soils would be stockpiled and re-used to minimize potential mixing of productive topsoils with deeper subsoils.
- After construction and decommissioning are each completed, the site would be revegetated with an approved seed mix. When required, the seed would be applied in conjunction with mulch and/or stabilization matting to protect the seeds as the grass establishes. Revegetation would take place as soon as site conditions and weather allow, following construction and decommissioning.
- If water crossings are needed, check dams and sediment traps would be used during the construction of low-impact ford crossings or culvert installations. The check dams and sediment traps would minimize downstream sedimentation during construction of the stream crossings.
- During construction and operation, source control measures would be identified in the SPCC Plan to reduce the potential of chemical pollution in surface water or groundwater during construction.
- To the extent practicable, construction activities would be scheduled to occur in the dry season, when soils are less susceptible to compaction and erosion. Similarly, soil disturbance would be postponed when soils are excessively wet, such as following a precipitation event.
- Equipment oil-filling, fueling, or maintenance activities would occur a substantial distance from watercourses or wetlands to minimize water quality impacts in the event of an accidental release. Oily waste, rags, or dirty or hazardous solid waste would be collected in sealable drums at the construction laydown yards, to be removed for recycling or disposal by a licensed contractor.
- During Project construction and operation, fuel or oil stored aboveground would be kept in secondary containment if it is located less than 600 feet from navigable waters of the state or near a drain that may impact navigable waters of the state.
- If temporary or permanent impacts on ephemeral and intermittent stream channels cannot be avoided, and work in the OHWL is necessary, a Hydraulic Project Approval may be required and would be applied from the Washington Department of Fish and Wildlife (WDFW) during final design of the Project.
- Detailed design of each stream crossing would be determined during the design phase. The general strategy for the stream crossings is as follows:
  - Solar Area Layouts: solar array placements are limited to a maximum slope of 14 percent, and steep canyon areas (where streams run) should be avoided. In most cases, collector lines would run overhead at these canyon areas or be routed around them. In cases where buried collector lines do need to cross a stream, wetland, or drainage ditch/swale, the crossing is typically accomplished by boring beneath the

stream bed. If access roads are required to cross a stream bed, then a suitably sized culvert should be installed to permit through flow. A hydrologic and hydraulic analysis is required to be performed to analyze the stream flow and properly size any installed culvert(s), water crossing, or bridge structures, if required. Where possible, the access roads may be routed around stream beds.

- Turbine Layouts: it is primarily collection lines that would cross the identified streams. If the stream crossing is in a steep canyon then the collection line is typically strung overhead, and in other areas the collection line is typically bored under the existing stream or drainage bed. Where collector and transmission lines cross Sheep Canyon and Webber Canyon, the lines would run overhead, and disturbance of stream features and adjacent steeply sloped habitat would be avoided. Most access roads are placed at saddles between the high points, but where streams must be crossed then a suitably sized culvert would be designed and installed to permit through flow. A hydrologic and hydraulic analysis would be performed to analyze the stream flow and properly size any installed culvert(s), water crossings, or bridge structures, if required. Where possible, the access roads may be routed around stream-beds.

- The Applicant would monitor erosion during operation of the Project on a regular schedule and after large rainfall or snowmelt events. Corrective action would be taken as necessary. All Project facilities would be designed, operated, and maintained to minimize erosion potential, and permanent stormwater BMPs would be installed to control runoff. The permanent BMPs would be maintained for the life of the Project.
- Water use would be minimized by using solar panel washing methods that reduce the required amount of water, such as using robotic panel washing equipment.
- Washing of solar panels would be conducted using only water, with no surfactants or other chemicals added.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.4.2.5, Post-Adjudication Applicant Commitments.

4.4.2 Impacts of Proposed Action

Potential impacts related to the turbines, solar arrays, and battery energy storage systems (BESS) may be generalized when impacts are common within the Wind Energy Micrositing Corridors or Solar Siting Areas. Where impacts on water resources are anticipated to differ, the impacts are broken into individual Project components. This Environmental Impact Statement (EIS) describes potential impacts specific to each proposed turbine option (represented by Turbine Option 1 or Option 2), solar fields, BESS, or substations where this information was available in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022). For the purpose of the water resources impact assessment, the Project components considered are described below**:**

- **Wind Energy Micrositing Corridor:** The Micrositing Corridor includes the wind turbine towers, access roads, crane paths, laydown areas, operation and maintenance (O&M) facilities, meteorological towers, collector lines, and transmission lines. The Applicant provided the areas of disturbance related to Turbine Option 1 but not for Turbine Option 2. Option 1 includes a greater number of turbines than Option 2. It is assumed that Option 2 would have the same or, potentially, fewer impacts on water resources than Option 1. Therefore, only Option 1 is assessed.
- **Solar Arrays:** Three Solar Siting Areas are proposed. Impacts from the Solar Siting Areas are further divided into the East Solar Field, County Well Solar Field, and Sellards Solar Field, where impacts are

anticipated to differ. The three Solar Siting Areas differ in size based on total acreage of impact. Impacts from the Solar Siting Areas include areas under the solar arrays and within the permanent fence.

- **Battery Energy Storage Systems:** Up to two BESS are proposed.[21] Impacts on water resources from the BESS are not anticipated to differ, so one assessment is provided that applies to all BESS.
- **Substations:** Five substations are proposed. Each substation is anticipated to have the same impact on water resources, so one assessment is provided that applies to all substations.
- **Comprehensive Project:** The assessment of the comprehensive Project includes combined impacts from all components.

4.4.2.1 Impacts during Construction

The following Project activities would have the potential to cause impacts on water resources during construction:

- **Site clearing:** Vegetation and soils would be removed during construction. Soils unsuitable for construction (such as organics and silts) would be removed from the site, and load-bearing granular materials and aggregates would be brought to the site to facilitate construction. Site clearing would remove vegetation and expose soils, which could result in erosion from surface water runoff that could enter nearby waterways.
- **Stockpiling soil:** Removal of soil and storage on site for future work could increase the potential impacts for generation and mobilization of sediments into downstream water resources.
- **Site grading:** Moving material onto the site and placing fill or other soil on the site could increase the potential for generation and mobilization of sediments into downstream water resources. Change in contours could interrupt and alter the movement of water on the site.
- **Concrete work:** Project construction would use approximately 500,000 cubic yards of concrete for facility foundations (Horse Heaven Wind Farm, LLC 2022). This would be considered “significant concrete work” under a Construction Stormwater General Permit, as the total work would be greater than 1,000 cubic yards of concrete placed or poured. Concrete would be required for the concrete pads that would be constructed for the wind turbines, substations, BESS, and O&M facilities (Horse Heaven Wind Farm, LLC 2022).

  Mixing and pouring concrete on site for Project components such as turbine footings could increase the potential for release of alkaline wash water that could impact water resources. The use of an on-site concrete batch plant during construction of the Project and potential impacts to water resources was analyzed as part of the assessment. The Applicant indicated that the on-site concrete batch plant would be located in the east laydown area for Phase 1 construction and the west laydown area for Phase 2 construction. Concrete work has the potential to impact surface water and water quality.
- **Increase in impervious surfaces:** “Impervious surface” refers to components of the built environment that have lower absorption capacity than natural ground cover. Examples of impervious surfaces include pavement, gravel, and concrete. Impervious surfaces, relative to natural ground cover, have reduced water infiltration rates relative to the amount of water that is lost as surface runoff. Project construction would increase impervious surfaces within the Lease Boundary through the creation of gravel roads, crane paths,

[21] The Applicant provided three locations for consideration of constructing the two BESS. An analysis for all the components and distinct parts as presented in Table 2.1-1 of the ASC has been completed where enough information was provided to do so.

and concrete turbine footings. This could increase the potential for surface water runoff to the receiving environment. Many biological and physical measures of stream quality decline with increasing cover of impervious surfaces in a watershed. As a basic framework, impervious surface cover within a watershed can be used to estimate stream quality (Centre for Watershed Protection 2003).

- **Water use:** Project construction would require water for road construction, concrete mixing, dust control, etc. According to the 2022 ASC, water would be sourced from suppliers located near the Lease Boundary and would likely be sourced from local public utilities. This may include a local off-site public utility with water sources being the Columbia or Snake River, local private irrigators with collector wells on the banks of the Columbia River, or wells that are fed from regional aquifers (Horse Heaven Wind Farm, LLC 2022). Appendix J of the ASC includes a letter from the Port of Walla Walla indicating an Availability of Water for Hire as a potential supplier (Horse Heaven Wind Farm, LLC 2022). If the Project requires large amounts of water for routine activities during construction or operations, water use on site presents the potential to impact public water supply as the water would be sourced from an available public utility. Water use on site would be required for concrete works during construction and would be required for building facilities during operation. This is discussed further in the public water supply subsection below. Additional assessment of public water supply as a social resource is discussed in Sections 3.15 and 4.15 (Public Services and Utilities).
- **Hazardous substances:** Use and storage of hazardous substances on site presents the potential for an accidental spill that could enter waterways within the Lease Boundary.

Impact Description

This section evaluates impacts on water resources from the Proposed Action. The following potential impacts were identified for construction and are evaluated further for each water resource:

- Physical disturbance
- Water quality
- Hydrology
- Introduction of hazardous substances
- Public water supply security

For each impact, the adverse effects on surface water, runoff and absorption, floodplains, groundwater, and public water supply are further evaluated, where applicable. The five impacts and how they are used to assess impacts are defined below.

Physical Disturbance

Physical disturbance refers to a physical alteration of a water resource that results from Project disturbance. Physical disturbance could result from either a temporary or a permanent disturbance during construction.

- **Temporary disturbance** is defined as an alteration of a water resource for part or all of the duration of Project construction, which would be returned to pre-disturbance conditions following construction.

- **Permanent disturbance** is defined as an alteration of a water resource for the life of the Project, from construction through to decommissioning, which would be returned to pre-disturbance conditions following decommissioning.

Surface Water and Wetlands

The 2022 ASC identifies 31 ephemeral streams and two intermittent streams that intersect the Wind Energy Micrositing Corridor and Solar Siting Areas (see Section 3.4 of this EIS) (Horse Heaven Wind Farm, LLC 2022). The Project is anticipated to have the following impacts on these streams:

- Temporary disturbance from collection lines, roads, crane paths, and transmission lines would impact 19 of the 31 mapped ephemeral streams and both intermittent streams located within the Micrositing Corridor.
- Permanent disturbance of one ephemeral stream would occur within the ordinary high-water level (OHWL) and is anticipated to be required to construct a road culvert within the Micrositing Corridor.

The wetland located within the Lease Boundary is rated as Category IV according to the Washington State Department of Ecology's (Ecology's) Washington State Wetland Rating System for Eastern Washington and is not within the temporary or permanent disturbance areas (Hruby 2014; Horse Heaven Wind Farm, LLC 2022). The wetland is located approximately 240 feet from the Micrositing Corridor, which meets the minimum buffer for a Category IV Wetland of 40 feet in Benton County (Benton County Code 15.04; Benton County 2018). No impacts to wetlands or wetland buffers are anticipated to occur from Project construction.

The Applicant has included two laydown areas which would be used as the locations for a temporary concrete batch plant: two laydown areas are located in the east and one in the west. The distance of the laydown areas from surface water and wetlands was measured to help identify potential impacts:

- Laydown Area 1 located in the west Project Lease Boundary is located approximately 1,812 ft from the nearest mapped stream.
- Laydown Area 2 located in the east Project Lease Boundary intersects a mapped stream. Approximately 72 square feet of the laydown area overlaps the stream.

Vegetation clearing and soil disturbance may be required as part of the construction of laydown areas and to establish a temporary batch plant. The overlap of Laydown Area 2 would result in impacts to instream habitat that may have impacts to surface water. Disturbance within instream areas has increased potential for sedimentation, even if instream work is completed during the dry season. Vegetation clearing would remove plant roots which help provide soil stability to soil and soil disturbance loosens soil which could increase the risk of sedimentation. Additional permits for instream work are likely to be required to construct the Project as proposed by the Applicant. If so, the Applicant may be required by EFSEC and its consulting agency to demonstrate that instream work cannot be avoided to construct the Project.

Runoff/Absorption

Project construction could result in increased runoff or a loss of absorption capacity within the Lease Boundary. Site clearing would remove vegetation and soils that act to intercept water and aid in infiltration. Physical disturbance of vegetation and soils during Project construction could increase surface runoff and erosion. In addition, construction of roads, turbine footings, and other Project infrastructure would increase the area of impervious surface within the Lease Boundary, which could also reduce the absorption capacity and increase surface runoff.

In total, Project construction would result in 2,952 acres of temporary disturbance and 6,869 acres of permanent disturbance. Areas of disturbance associated with each Project component are summarized in Tables 2.1-1 and 2.1-2 of Chapter 2. The areas of permanent disturbance within the Micrositing Corridor are assumed to be primarily impervious surfaces, including gravel roads, concrete tower footings, tower pads, and other Project infrastructure.

Rain events during Project construction could result in increased runoff from the site. Changes to contours from Project construction would be minimal, and stormwater would be expected to continue to follow the natural contours of the site (Horse Heaven Wind Farm, LLC 2022). Temporary disturbance areas would be revegetated following construction, restoring absorption capacity, while permanent disturbance areas would remain until decommissioning and correspond to the areas where infrastructure such as panel footing remain. Mulching would be used to stabilize soils on site until vegetation becomes established (Horse Heaven Wind Farm, LLC 2022). In addition, within the Solar Siting Areas revegetation would occur under and between the solar panels following Project construction with low-growing grasses and forbs similar to temporary disturbance areas. It is assumed that the absorption capacity after revegetation would be the same as pre-disturbance within Solar Siting Areas (Horse Heaven Wind Farm, LLC 20212).

Soils within the Lease Boundary have moderate permeability. Given the depth of soils, surface water is expected to continue to infiltrate the ground both during and after construction; therefore, increased surface runoff would be minimal (Horse Heaven Wind Farm, LLC 2022). Construction is proposed to occur in a phased approach, enabling revegetation to be performed in areas of temporary disturbance where construction has been completed (Horse Heaven Wind Farm, LLC 2022). This would limit the amount of exposed soil at any given time. Because the area’s climate is seasonally dry, impacts resulting from increased runoff related to temporary or permanent disturbance would be most pronounced during heavy rainfall events. Storms in eastern Washington are typically high-intensity but short in duration (Ecology 2019). Erosion potential increases with the intensity and duration of rain events (Ritter 2012).

Based on the Applicant’s habitat mapping, impervious surfaces are assumed to be associated with the developed/ disturbed habitat category. Approximately 1.2 percent of the Lease Boundary is mapped as developed/disturbed (Horse Heaven Wind Farm, LLC 2022). The Project would increase impervious surfaces within the Lease Boundary. Impervious surfaces resulting from Project construction would increase the total impervious surfaces by approximately 0.4 percent in the Lease Boundary, excluding the permanent disturbance within Solar Siting Areas. The total impervious surface, assuming no other development in the Lease Boundary, would increase to approximately 1.6 percent of the Lease Boundary.

Solar Arrays

Impervious surfaces include the permanent gravel access roads, concrete turbine footings, substations, and BESS. Solar Siting Areas were excluded because, while they would involve permanent disturbance due to the solar arrays and installed fencing, they would be revegetated following construction and thus would not result in a permanent impervious surface on the ground. The ground under the solar arrays in the Solar Siting Areas would remain natural soil and be revegetated with low-growing grasses and forbs (Horse Heaven Wind Farm, LLC 2022).

High flows can result in increased erosion if unmitigated, and erosion begins to occur within steam channels when impervious surfaces reach 5 percent of the watershed (Ecology 2019). Impervious surfaces could increase surface runoff to surface water within the Lease Boundary, potentially leading to increased erosion and sediment mobilization. Water within the Lease Boundary ultimately drains into the Yakima and Columbia Rivers, both of which are fish-bearing. However, Project construction would include a Stormwater Pollution Prevention Plan (SWPPP) that would identify appropriate mitigation and BMPs for reducing surface runoff from the Project. In addition, given the capacity for water infiltration of the surrounding Lease Boundary, surface runoff is anticipated to be intercepted by vegetation and infiltrate the soil.

Floodplains

Floodplains are areas adjacent to water sources that are periodically flooded and provide several important ecological functions, including:

- **Water storage:** During flood events, floodplains serve to store excess water, slow water velocity, and reduce erosion.
- **Flow rate and erosion reduction:** Vegetated floodplains slow overland flow, which allows water time to infiltrate the ground, thereby recharging groundwater and reducing erosion.
- **Filter water:** Vegetated floodplains can filter nutrients and pollutants from water before they enter downstream waterways (FEMA 2020).

Within the Lease Boundary, approximately 149 acres of land within the 100-year floodplains/Frequently Flooded Areas are known to occur. CARAs are identified by Ecology to protect community drinking water by preventing pollution of groundwater and maintaining supply (Ecology 2005). The 2022 ASC identifies approximately 0.8 acres of land within the 100-year floodplains/Frequently Flooded Areas, which are associated with CARAs, that would be temporarily impacted during Project construction (Horse Heaven Wind Farm, LLC 2022). Temporary disturbance from construction would occur in less than 1 percent of the floodplains within the Lease Boundary.

The Applicant has included a commitment to avoid impacts on water resources by spanning or otherwise micrositing away from the streams (Horse Heaven Wind Farm, LLC 2022). The temporary impacts identified on the 100-year floodplain are associated with the 230 kV transmission line and was calculated using a standard buffer width for the transmission line for the solar connection. The Applicant indicates that the construction limits would be modified to reduce impacts as much as possible to areas within the 100-year floodplain during final design (Horse Heaven Wind Farm, LLC 2022). Clear-spanning the transmission line over the 100-year floodplain would avoid temporary disturbance, including vegetation removal and soil disturbance in the floodplain. Project construction and decommissioning would require site clearing, which would also temporarily impact the ecological functions provided by floodplains. No permanent features are proposed to be developed within the 100-year floodplain.

No physical disturbance of floodplains from the solar arrays, BESS, or substations would occur during Project construction; therefore, impacts are not anticipated, and no further assessment is provided. Impacts from the comprehensive Project are rated the same as for the Micrositing Corridor.

Groundwater

Project construction would not use groundwater resources, and it is unlikely that the Project would affect groundwater quantity, quality, or flow direction (Horse Heaven Wind Farm, LLC 2022). Water required for Project construction would not be sourced from groundwater resources on site but would be acquired from a public water supply and transported by truck to the site (Horse Heaven Wind Farm, LLC 2022).

While groundwater would not be directly impacted, it could be indirectly impacted through loss of associated alluvial soils. Soil functions to filter pollutants from surface runoff, and soil biota can degrade pollutants prior to water reaching groundwater sources (Keestra et al. 2012). Impacts on groundwater from Project construction would include temporary disturbance of approximately 1.6 acres of alluvial soils (i.e., soils deposited by surface water) associated with CARAs. Approximately 160 acres of alluvial soils occur within the Lease Boundary. Less than 1 percent of alluvial soils would be temporarily disturbed during Project construction.

The alluvial soils that would be temporarily impacted are located within the Micrositing Corridor; therefore, the physical disturbance of groundwater resources is assessed for the Turbine Option 1 and Option 2 separately from the other Project components. Temporary disturbance of alluvial soils would result in an indirect impact on groundwater resources.

No other Project components would result in physical disturbance to groundwater resources, and they are not assessed further. Impacts that would result from the comprehensive Project would be the same as impacts from the Micrositing Corridor.

Water Quality

Surface Water and Wetlands

Project construction activities such as clearing, concrete works, soil stockpiling, and runoff from gravel roads could result in impacts on water quality. Impacts on surface water quality could occur where construction activities interact with ephemeral and intermittent streams. Ephemeral streams flow only during and shortly after major precipitation events, while intermittent streams contain water seasonally, typically during seasonal precipitation, winter snowmelt, and spring runoff (Nadeau 2015). Impacts on water quality would increase during precipitation events and during seasons of high flow such as winter snowmelt and spring runoff, as there would be potential for contaminants or sediments to be carried downstream.

Potential impacts on water quality include increased sedimentation, change in water pH from concrete and from the concrete batch plant, and change in water quality parameters. Impacts on water quality are rated as direct impacts from Project construction because they would occur at the same time and place as the activity. Mitigation measures, including an SWPPP and BMPs, would reduce the potential for impacts on water quality. Project construction within the Micrositing Corridor would interact with ephemeral and intermittent streams, which could impact water quality. Furthermore, the east and west construction laydown areas are located within the Micrositing Corridor. Therefore, the Micrositing Corridor is rated separately from other Project components.

A portion of Laydown Area 2 is located within a mapped stream, which increases the risk for impacts to water quality from the concrete batch plant. The Applicant has included commitments to complete the necessary permits including a Construction Stormwater General Permit and Sand and Gravel General Permit. Due to the size of the concrete works (>1,000 cubic yards of concrete placed or poured) the Project qualifies as significant concrete works and pH sampling will be required under the permit (Horse Heaven Wind Farm, LLC 2022). The US EPA water quality guidelines for freshwater suggest a pH of 6.5 to 9.0 for freshwater. Concrete wash water is highly alkaline with high pH values (typically greater than 11) (Aruntaş et al. 2022). Prolonged exposure to high pH levels can cause impacts to certain fish organs such as gills or eyes (EPA 2023). The Sand and Gravel Permit and Construction Stormwater General Permit do not allow the discharge of water outside the range of pH 6.5 to 8.5 standard units. The location of Laydown Area 2 within a stream creates increased potential for impacts to surface water from concrete batch plants due to accidents and malfunctions.

Ephemeral stream channels were identified in the East Solar Field and Sellards Solar Field (Section 3.4, Table 3.4-2). While neither temporary nor permanent disturbances are planned within the waterways, the proximity of Project construction to surface water could impact water quality through surface runoff or other pollutants. Impacts on water quality from the East Solar Field and Sellards Solar Field would be minimized with the preparation of and adherence to an SWPPP, installation of BMPs, and the maintenance of vegetation adjacent to streams that can intercept water and allow infiltration into the ground before the water reaches a stream.

No stream channels were identified within or adjacent to the County Well Solar Field, BESS, or substations; therefore, no impacts are anticipated.

Hydrology

Surface Water and Wetlands

Project construction would require the removal of vegetation and soil during temporary disturbance, which could impact stream hydrology (Ecology 2019). Stream hydrology in this context refers to the behavior of surface water and impacts on the movement of surface water. Impacts during Project construction could result in increased potential for erosion and mobilization of sediments or change in topography of the stream from increased surface runoff; however, ephemeral and intermittent streams are prone to these impacts naturally. Ephemeral and intermittent streams exhibit high variation in the amount of water flow at various points throughout the year compared to perennial streams, which have a more constant flow. In semi-arid and arid areas, this often results in greater surface runoff and erosion (Levick et al. 2008). The Applicant would revegetate areas of temporary disturbance along ephemeral and intermittent streams following construction, which can mitigate some of the impacts.

The construction of permanent gravel roads and wind turbine footings would also increase the total area of impervious surfaces within the Lease Boundary as part of the permanent disturbance from the Project, which could impact stream hydrology by changing long-term sedimentation rates (Ecology 2019). The gravel roads that intersect with streams in the Lease Boundary are located within the Wind Energy Micrositing Corridor. In addition, the installation of a culvert at one of the intermittent streams, as currently proposed, could also increase the potential for erosion and sedimentation, resulting in changes to the stream channel. Over time, culverts can cause increased scour at the inlet and accumulation of sediment at the outlet unless they are appropriately armored with large-diameter clean rock (i.e., riprap) and designed to an appropriate size to accommodate seasonal high flows for the area (USDA 2009). The increase in impervious surfaces and installation of a culvert are assessed as indirect impacts because the impact may not be realized at the time of construction, although may become evident over time..

Ephemeral and intermittent streams would be temporarily and permanently impacted by construction within the Wind Energy Micrositing Corridor but would not be impacted during construction of other Project infrastructure. Therefore, the potential for impacts from Turbine Option 1 and Option 2 are assessed separately from other Project components. The potential impacts within the Wind Energy Micrositing Corridor are assessed for the proposed temporary disturbance and the proposed permanent disturbance.

Project construction of the solar arrays, BESS, and substations would not result in temporary or permanent disturbance to the ephemeral and intermittent streams; therefore, impacts are not anticipated and the Project components are not assessed further. Assessment of the impacts of the comprehensive Project are the same as for the Micrositing Corridor.

Introduction of Hazardous Substance

Surface Water and Wetlands

Hazardous substances that would be required for Project construction include diesel fuel, synthetic lubricating oil, glycol-water mix, transformer mineral oil, concrete, and hydraulic fluid (Horse Heaven Wind Farm, LLC 2022). During Project construction, there is potential that these hazardous substances could be accidentally released into surface water. Spills of hazardous substances would have the greatest impact on surface water during seasonally wet periods within the winter and spring months and during periods of rainfall. During these times, ephemeral and intermittent streams could convey spilled hazardous substances beyond the Lease Boundary into downstream environments within the watershed. Spills could cause water or soil contamination, change water chemistry or quality, and impact fish habitat in downstream environments.

During Project construction, a hazardous substance spill could occur during equipment maintenance, fueling, or concrete placement, or as a result of improper maintenance procedures. The potential sources of hazardous substances during Project construction are anticipated to be small point sources, such as an oil leak from a piece of equipment. Hazardous substances would be stored in temporary aboveground tanks in the construction yard during construction within an area that provides secondary containment (Horse Heaven Wind Farm, LLC 2022). Where practicable, the Applicant proposes conducting work within streams outside the seasonally wet period and during dry conditions. Spill response equipment would be stored on site within each vehicle to respond to accidental release of hazardous substances (Horse Heaven Wind Farm, LLC 2022).

Diesel products and hydrocarbons range in their chemical composition. In general, products are moderately soluble and are somewhat persistent in the environment. Because of its persistence, diesel can cause toxic effects on invertebrates and wildlife that live in water or sediments (API 2016). Diesel and other hydrocarbon-based products readily penetrate porous substances such as soil (API 2016).

Floodplains

Project construction could result in a spill of a hazardous substance that has the potential to impact floodplains. Diesel products and hydrocarbons range in their chemical composition and can cause soil contamination. Release of a hazardous substance that could occur during Project construction has the potential to impact vegetation within the adjacent floodplain areas that are not already disturbed from construction. Loss of vegetation within floodplain environments could impact the ecosystem services provided by floodplains, including slowing water runoff, trapping sediments, and improving water quality (Suchara 2018).

The introduction of a hazardous substance could occur for any Project component, but only the Wind Energy Micrositing Corridor would have potential to impact floodplains within the Lease Boundary. During Project construction, spills of a hazardous substance could occur during equipment maintenance, fueling, or concrete placement, or due to improper maintenance procedures. A Spill Prevention Control and Countermeasures (SPCC) Plan would be created for the Project (Horse Heaven Wind Farm, LLC 2022). The potential sources for the introduction of hazardous substances are expected to be small point sources, and spill response equipment would be available on site (Horse Heaven Wind Farm, LLC 2022).

The impact of the Solar Arrays, substations, and BESS would be negligible as floodplains do not occur in these areas, and they are not assessed further. The impacts of the comprehensive Project would be the same as the Micrositing Corridor.

Groundwater

Project construction could result in the introduction of hazardous substances; however, impacts on groundwater would be unlikely. Diesel products and hydrocarbons range in their chemical composition. Diesel and other hydrocarbon products readily penetrate porous substances such as soil (API 2016). The movement of hazardous substances through porous soil would have the potential to impact groundwater. If hazardous substances contact groundwater, there would be the potential for impacts on water quality and water chemistry and, potentially, downstream impacts as well. The greatest area of potential impact would be areas of alluvial soils associated with CARAs within the Micrositing Corridor.

Depth to water within the Lease Boundary averages 184 feet. The SPCC Plan would include measures for preventing and controlling spills during construction and operations (Horse Heaven Wind Farm, LLC 2022). Sources for accidental spills would likely be small point sources, and spill response equipment would be available on site. A critical component to preventing impacts on groundwater from an accidental spill is having resources available on site and having employees trained and prepared to respond to an incident.

Impacts on Public Water Supply during Drought or Water Shortage

Project construction activities that would require water include concrete pouring, fugitive dust control, and fire prevention, when required. Construction would require an estimated 220,000 gallons per day, for a total construction demand of approximately 120 million gallons of water (Horse Heaven Wind Farm, LLC 2022). The anticipated amount of water required during construction includes an estimated 12.6 million gallons that would be specifically required for on-site concrete batch plants. The Applicant has indicated that an on-site concrete batch plant would be required and would be sited in the east laydown area during Phase 1 of construction (approximately four months) and moved to the west laydown area during Phase 2 of construction (approximately four months). Impacts from on-site concrete batch plants to public water supply have been included in the assessment (Horse Heave Wind Farm, LLC 2023a).

The Project would obtain water from a local off-site public facility, local private irrigators, or wells that are fed from regional aquifers (Horse Heaven Wind Farm, LLC 2022). Water would be transported to the site by truck and stored in water tanks during construction. Appendix J of the ASC includes a letter from the Port of Walla Walla indicating an Availability of Water for Hire as a potential supplier (Horse Heaven Wind Farm, LLC 2022).

Water used for construction would be required for all Project components. The estimate of 120 million gallons of water is for the comprehensive Project. It is assumed the water required for individual Project components would be less than the comprehensive Project. The impact on water supply would be direct. The magnitude is rated low for individual Project components and medium for the comprehensive Project. The duration would be temporary, as impacts would be anticipated if water demand for construction exceeds available supply, particularly in the event of a drought or when water restrictions are imposed to conserve for other uses, such as domestic consumption and fire response. The likelihood is rated feasible as water would be required for construction. The spatial extent would be regional as impacts on public water supply could affect the regional scale.

Turbine Option 1 and Turbine Option 2

The impact ratings for Turbine Option 1 and Option 2 are described below. The ASC provides only disturbance data for Turbine Option 1, and therefore, impacts from Turbine Option 2 on water resources are anticipated to be the same.

- **Physical Disturbance:** The physical disturbance to water resources is rated low magnitude. Physical disturbance within the Micrositing Corridor would temporarily impact 19 ephemeral streams, two intermittent streams, 72 square feet within a stream, and less than 1 percent of alluvial soils within the Lease Boundary. Temporary disturbance in the 100-year floodplain is assumed to be avoidable by clear-spanning the transmission line over the 100-year floodplain. Permanent disturbance from construction would impact one intermittent stream. Mitigation measures including applications for a Hydraulic Project Approval, preparation of an SWPPP, and implementation of BMPs would reduce the impacts on water resources during construction. The duration of the impacts is rated short term for temporary disturbance and long term for permanent disturbance. The likelihood of impact is rated unavoidable. While the ASC indicates that disturbance to these water resources would be required for construction, Applicant commitments would reduce the likelihood of impact. The spatial extent is rated confined to the Lease Boundary. Temporary and permanent disturbance within the Micrositing Corridor would impact a large area in the Lease Boundary through vegetation removal and soil disturbance, which are important for intercepting and absorbing water.
- **Water Quality:** Impacts on water quality are rated low magnitude because the streams on site are dry for most of the year. Laydown Area 2, where the temporary concrete batch plant will be sited, occurs within a stream area, which increases the risk to water quality from accidents and malfunctions; however, proposed mitigation measures are anticipated to minimize potential impacts. The duration of impacts is rated temporary as the impacts would only affect water quality if water were present in the streams. The likelihood of impacts on water quality during construction is rated as unlikely, as scheduling construction activities near streams during the dry season along with BMPs would minimize the chance of occurrence. The spatial extent of the impact is rated local because impacts on water quality could impact downstream environments outside the Lease Boundary.
- **Hydrology:** Impacts on hydrology from Project construction would be direct. The impact is rated low magnitude. The duration is rated short term for temporary disturbance and long term for permanent disturbance. The permanent disturbance relates to the potential impacts on stream hydrology following the culvert installation in the intermittent stream. The likelihood of impacts from temporary disturbance during construction is rated as unlikely with implementation of Applicant commitments consistent with the SWPPP and TESC plan. The spatial extent is rated limited. The likelihood of impacts from permanent disturbance (i.e., the culverted intermittent stream) is rated unavoidable, as a culvert is anticipated to be required. The impacts would be minor, provided that the culvert is appropriately designed (i.e., sized) to minimize restriction on flows; installed with a headwall at the intake and outlet to convey flows into the culvert (thereby minimizing the potential for flows bypassing the culvert), and protected with riprap armoring at the inlet and outlet to minimize erosion and scour. The spatial extent is rated limited due to the small area within the Lease Boundary.
- **Introduction of Hazardous Material:** Introduction of hazardous substances would be a direct impact on water resources because it would occur at the time and place of the activity. The impacts are rated low magnitude. Potential spills during construction would likely be small point sources. Applicant committed measures would minimize the risk. The duration is rated temporary with implementation of mitigation

measures, including an SPCC Plan. Spill response equipment would also be stored on-site at construction locations, which would provide an immediate response to spills should they occur. The likelihood is rated as unlikely. The spatial extent is rated as local, as impacts could extend beyond the Lease Boundary during high-rainfall events or the wet season.

- **Impacts on Public Water Supply:** For impacts on public water supply, the magnitude is rated low and the duration is rated temporary. The likelihood is rated feasible. Water would be required for construction and concrete is a water-intensive material; however, impacts on public water supply would be anticipated only during drought or water shortage. The spatial extent would be regional as impacts on public water supply could affect the regional scale.

Solar Arrays

The impact ratings for the Solar Arrays during Project construction are described below.

- **Physical Disturbance:** The impacts from physical disturbance of water resources are rated low for the Solar Arrays. Impacts are mainly related to vegetation clearing and soil disturbance that could impact absorption capacity during construction. Mitigation measures including an SWPPP and TESC plan would reduce the risk. The duration is rated short term for temporary disturbance and permanent disturbance. Permanent disturbance within the Solar Siting Areas is associated with areas under the solar arrays; however, the Applicant has committed to revegetating under solar arrays following construction. The likelihood is rated as unavoidable, and the spatial extent is rated confined.

- **Water Quality:** Based on the field-delineated streams by the Applicant, ephemeral stream channels were identified in the East Solar Field and Sellards Solar Field. Impacts on water quality could result to ephemeral streams adjacent to disturbance areas associated with construction of the solar fields. The magnitude of impact is rated negligible as a vegetated buffer would be maintained between the physical disturbance and the streams. While temporary and permanent disturbance are not planned within the stream channel, there is potential that surface runoff from construction could impact water quality within the ephemeral stream channels. The Applicant commitments, including an SWPPP, installation of BMPs, and the maintenance of vegetation adjacent to streams that can intercept water and allow infiltration into the ground before reaching a stream, which would minimize the impact. The duration of impacts would be temporary as impacts would only affect water quality if water were present in the streams. The likelihood of impacts is rated as unlikely. The spatial extent of the impact on water quality would be local because impacts on surface water quality could impact downstream environments outside the Lease Boundary.

  The Applicant did not identify any field-delineated streams in the County Well Solar Field. National Wetland Inventory Mapping shows streams within the County Well Solar Field, but none are located within the proposed disturbance for the solar arrays. The impact ratings are identical to the East Solar Field and Sellards Solar Field. Magnitude of impacts is rated negligible. The duration is rated temporary. The likelihood is rated unlikely. The spatial extent is rated local.

- **Hydrology:** No impacts are anticipated from the Solar Siting Areas, and no further assessment is required.

- **Introduction of Hazardous Material:** The impacts from the introduction of hazardous substances are rated negligible in magnitude as construction activities would be sited away from water resources. In the event of a spill, potential releases of hazardous materials on site would likely be small point sources that are expected to be contained using spill response equipment. The duration of impact would be temporary as effective mitigation measures could address a spill quickly. The likelihood is rated as unlikely. The spatial extent would be limited as movement beyond the initial release point would not be anticipated.

- **Impacts on Public Water Supply:** Impact ratings are identical to Turbine Option 1 and Option 2. The magnitude of impacts on public water supply from construction within the Solar Siting Areas is rated low. The duration is rated temporary. The likelihood is rated feasible, and the spatial extent would be regional.

Battery Energy Storage Systems

The impact ratings for the BESS are described below based on the impact descriptions in Section 4.4.2.1.

- **Physical Disturbance:** No impacts on surface waters are anticipated; however, absorption capacity could be impacted by construction through vegetation removal and soil disturbance. Impacts from physical disturbance are rated low magnitude. The duration of impacts is rated short term for temporary disturbance and long term for permanent disturbance. The likelihood is rated unavoidable, and the spatial extent is rated limited.
- **Water Quality:** Impacts on water quality from construction of the BESS are not anticipated, and no further assessment is required.
- **Hydrology:** Impacts on hydrology from construction of the BESS are not anticipated, and no further assessment is required.
- **Introduction of Hazardous Material:** The magnitude of impacts on surface waters are rated negligible and the duration of impact is rated temporary. The likelihood of impacts on surface waters is rated as unlikely and the spatial extent would be limited. Hazardous material would not mobilize into waterways due to the siting of BESS away from streams.
- **Impacts on Public Water Supply:** The magnitude of impact on public water supply from BESS construction is rated low and the duration is rated temporary. The likelihood is rated feasible, and the spatial extent would be regional.

Substations

The impact ratings for substations are described below based on the impact descriptions in Section 4.4.2.1.

- **Physical Disturbance**: Construction of the substations would not impact streams or wetlands; however, physical disturbance from vegetation clearing and soil disturbance could impact absorption capacity. Impacts from physical disturbance during substation construction are rated low magnitude. The duration is rated short term for temporary disturbance and long term for permanent disturbance. The likelihood is rated unavoidable, and the spatial extent is rated limited.
- **Water Quality:** Impacts on surface waters are not anticipated, and no further assessment is required.
- **Hydrology**: Impacts on surface waters are not anticipated, and no further assessment is required.
- **Introduction of Hazardous Material:** Impact ratings are identical to the impact ratings for the BESS. The magnitude of impacts on water resources are rated negligible and the duration of impact is rated temporary. The likelihood is rated as unlikely. The spatial extent would be limited.

- **Impacts on Public Water Supply**: The magnitude of impacts on public water supply is rated low and the duration is rated temporary. The likelihood is rated feasible, and the spatial extent is rated regional.

Comprehensive Project

The impact ratings for the comprehensive Project are described below based on the impact descriptions in Section 4.4.2.1.1.

- **Physical Disturbance:** Impacts from physical disturbance are rated identical to impacts from Turbine Option 1 and Option 2. The magnitude is rated low. The duration would be short term for temporary impacts and long term for areas of permanent disturbance. The likelihood is rated unavoidable. The spatial extent is rated confined.
- **Water Quality**: Impacts on water quality from the comprehensive Project are rated identical to impacts from Turbine Option 1 and Option 2. The impacts are rated low magnitude and the duration of impacts is rated temporary. The likelihood of impacts on water quality is rated unlikely and the spatial extent of the impact is rated local.
- **Hydrology**: Impacts on hydrology from the comprehensive Project is rated identical to the impacts from the turbines. The impact is rated low magnitude. The duration is rated short term for temporary disturbance and long term for permanent disturbance. The permanent disturbance relates to the potential for impacts on stream hydrology following the culvert installation in the intermittent stream. The likelihood of impacts from temporary disturbance is rated unlikely, and permanent disturbance is rated as unavoidable, as a culvert is anticipated to be required. The spatial extent is rated limited.
- **Introduction of Hazardous Material**: The impacts from the introduction of hazardous material is rated identical to the turbines. The magnitude is rated low, and the duration is rated temporary. The likelihood is rated as unlikely, and the spatial extent is rated as local.
- **Impacts on Public Water Supply**: Impacts on public water supply from the comprehensive Project are rated medium due to the larger water use required by the sum of Project components in comparison to the individual components. The duration of impacts would be rated temporary. The likelihood is rated feasible, and the spatial extent is rated regional.

4.4.2.2 Impacts during Operation

During Project operation, the following activities could result in impacts on water resources:

- Washing solar panels
- Runoff from impermeable surfaces
- Storing and using hazardous substances on the site
- Drought or water shortage that impacts public water supply

Impacts on water resources during operation include the following:

- Increase in surface water runoff
- Increase in sediment mobilization from surface runoff

- Change in water quality from surface water runoff
- Introduction of hazardous substances

Impact Description

Panel Washing

During operation, solar panel washing may be required to remove dirt, airborne dust, pollution, and other particulates that accumulate on the surface of the panels. This accumulation can reduce sunlight penetration and therefore efficiency of solar electricity production (Sugiartha et al. 2019). Washing solar panels restores panel efficiency. Based on the 2022 ASC, the estimated water use across all three solar areas would be approximately 2,025,000 gallons per year, if required (Horse Heaven Wind Farm, LLC 2022).[22] The Applicant indicates that the frequency of panel washing is presently unknown and that, if required, panel washing would occur a maximum of once per year (Horse Heaven Wind Farm, LLC 2022).

As a conservative estimate, the Applicant provided an assessment of the quantity of water that would reach the soil surface. If exactly one-third of the estimated panel washing water were used on the smallest Solar Siting Area, and if all water were to run off the solar panels, assuming no evaporation, the depth of water on the ground would be 0.012 inches across Sellards Solar Field. It is likely that all the water would infiltrate the ground, based on the moderate infiltration rate of soils on site (Horse Heaven Wind Farm, LLC 2022). Vegetation under the solar panels would also increase interception and slow the rate at which water reaches the ground, aiding in water infiltration. Areas within fence lines of the Solar Siting Areas would be vegetated except where permanent access roads and other impervious surfaces are required (Horse Heaven Wind Farm, LLC 2022). Simulations of runoff around solar panels indicate that increased runoff is not anticipated where vegetation is well-maintained under solar panels or in the areas between the solar panels (Cook and McCuen 2013).

Panel washing would use water only without additives (Horse Heaven Wind Farm, LLC 2022). The water used to wash solar panels would be unlikely to cause increased erosion within the Lease Boundary. During panel washing, most of the water would infiltrate directly into the ground. In the event that some of the water did not infiltrate directly into the ground in the vicinity of panels, it would be unlikely to reach any of the intermittent or ephemeral streams since it would be intercepted by vegetation in the vegetated strips between the rows of solar panels (Horse Heaven Wind Farm, LLC 2022). The distance between solar panels would be generally twice the height of the solar panels and would provide sufficient surface area to slow water runoff and allow water infiltration (Horse Heaven Wind Farm, LLC 2022). Because the water used for panel washing would not contain any added chemicals, there would be no need to treat panel wash water.

Panel washing would only be required for the solar arrays; therefore, the impacts of the Micrositing Corridor, substations, and BESS are considered negligible and are not assessed further. Solar panel washing would have an indirect impact on surface water and runoff/absorption. The impacts of panel washing on the comprehensive Project are anticipated to be the same as for the solar arrays.

Panel washing is not anticipated to impact floodplains or groundwater resources. The impacts of panel washing on public water supply are assessed separately.

[22] The EIS has assessed two of the three solar siting areas and therefore assessed a maximum of 1.35 million gallons of water required annually for washing solar panels during operations.

Surface Water Runoff from Impervious Surfaces

Project operation could increase surface water runoff from impervious surfaces. Project infrastructure with impervious surfaces includes the tower footings for the wind turbines and meteorological towers, permanent gravel roads, and areas for O&M facilities. Compacted gravel roads have low water infiltration rates in comparison to natural soil and can result in overland flow, particularly after rainfall events, although they have higher infiltration rates than asphalt paved surfaces. Increased surface water runoff could result in increased erosion and increased sedimentation into adjacent streams or the wetland.

Increase in impervious structures within a watershed can impact stream quality. Because less water infiltrates the ground, more water occurs as surface runoff. In extreme cases, urban development has altered the base flow of streams and can convert ephemeral streams into perennial streams due to changes in water inputs (e.g., irrigation) and decreased infiltration (Centre for Watershed Protection 2003). Furthermore, positive correlations exist between increasing impervious surfaces and increasing peak discharge (Centre for Watershed Protection 2003). Peak discharge is the maximum rate of flow during a storm event.

The wind turbines, meteorological towers, and gravel roads are located predominantly within the Micrositing Corridor. Increased surface water runoff is an indirect impact of Project operations.

The substations and BESS are not anticipated to impact surface water runoff during operation and are not assessed further. The solar arrays are not anticipated to impact surface water runoff from impervious surfaces as the areas under the arrays would be planted with low-growing grasses and forbs and would maintain absorption capacity. The comprehensive Project is rated the same as the Micrositing Corridor.

Introduction of Hazardous Substances

Hazardous substances that would be required for Project operation include diesel fuel, synthetic lubricating oil, glycol-water mix, transformer mineral oil, and hydraulic fluid (Horse Heaven Wind Farm, LLC 2022). Potential impacts of these substances are described in Section 4.4.2.1. Activities during Project operation that could result in the introduction of hazardous substances include fueling of vehicles and maintenance of Project infrastructure. Accidental releases are anticipated to be small, point source releases. Spill response equipment would be located on-site during Project operations (Horse Heaven Wind Farm, LLC 2022). Training would be given to all on-site workers to provide awareness of hazardous substances stored on site and how to properly store and clean hazardous substances (Horse Heaven Wind Farm, LLC 2022). During operation, small volumes of hazardous materials such as pesticide or herbicides, paint, solvents, or cleaners would be stored in the O&M facilities. No secondary containment is planned for the O&M facilities (Horse Heaven Wind Farm, LLC 2022).

Secondary containment is not required for qualified oil-filled operational equipment, which includes transformers and other equipment that contain oil solely to enable operation of the device (EPA 2006). Based on EPA Rule (2006), instead of secondary containment, the owner or operator of qualified oil-filled operational equipment may prepare an oil spill contingency plan and a written commitment of labor, equipment, and materials to control or remove discharged oil. The Applicant would install secondary containment for the substation transformers, and the turbine foundation would function as secondary containment for the turbine gearboxes (Horse Heaven Wind Farm, LLC 2022).

Impacts from the introduction of hazardous substances have the potential to occur for all Project components. Water resources are located only in a few areas of the Lease Boundary and are generally ephemeral and/or intermittent streams and therefore do not convey year-round flows. Potential impacts of the introduction of hazardous substances are considered direct impacts.

Surface Water

Ephemeral and intermittent streams would cross Project infrastructure within the Micrositing Corridor only, but not within the Solar Siting Areas, substations, or BESS.

Floodplains

The only areas of floodplain are located within the Micrositing Corridor. No permanent structures are sited within the 100-year floodplains and no interaction is anticipated.

Groundwater

Groundwater resources are not anticipated to be impacted by the introduction of hazardous substances as no permanent structures are sited within the alluvial soils associated with CARAs, and no further assessment is provided.

Impacts on Public Water Supply

Solar panel washing may be required in order to optimize performance and efficiency. If needed during operation, the solar panels are estimated to be washed once per year; however, the frequency with which solar panel washing would occur may be altered depending on the recommendations by the selected solar panel manufacturer (Horse Heaven Wind Farm, LLC 2022). For the purpose of the assessment, it is assumed that solar panels would be washed at a maximum frequency of once per year. It is anticipated that up to 0.5 gallons of water would be required per solar module on average, or up to approximately 2,025,000 gallons per year, if required (Horse Heaven Wind Farm, LLC 2022)[23]. In addition, water would be required for the O&M facilities. An estimated 5,000 gallons per day is estimated for kitchen and bathroom use, or approximately 1,825,000 gallons per year (Horse Heaven Wind Farm, LLC 2022).

Water for panel washing, if required, and for O&M facilities, would be required for the duration of operations. A potential impact on public water supply from Project operation would be decreased water security, primarily during drought or water shortage. The water used for Project operations would be transported to the site by truck (Horse Heaven Wind Farm, LLC 2022). The Applicant has indicated that water would be sourced from local public facilities, local private irrigators, and/or collector wells fed from regional aquifers (Horse Heaven Wind Farm, LLC 2022). Appendix J of the ASC includes a letter from the Port of Walla Walla indicating an Availability of Water for Hire as a potential supplier (Horse Heaven Wind Farm, LLC 2022). During operation, water use for panel washing would be minimized by using methods that reduce the amount of water required such as using robotic panel washing equipment (Horse Heaven Wind Farm, LLC 2022).

- It is assumed that panel washing would only be required for the solar arrays but water for O&M facilities would be required for all Project components. Therefore, the greatest impact on public water supply would be from the comprehensive Project and solar arrays.

Turbine Option 1 and Turbine Option 2

The impact ratings associated with Turbine Option 1 and Option 2 are described below and are anticipated to be the same during Project operation.

[23] The EIS has assessed two of the three solar siting areas and therefore assessed a maximum of 1.35 million gallons of water required annually for washing solar panels during operations.

- **Surface Water Runoff from Impervious Surfaces**: The impact of increased surface water runoff from impervious surfaces is rated low. The Project would increase impervious surfaces by approximately 0.4 percent in the Lease Boundary. While this is a small change overall in the Lease Boundary, the increase in impervious surfaces would be a 33 percent increase from current levels. Mitigation measures proposed by the Applicant are anticipated to reduce surface runoff to a similar level as existing conditions; therefore, the magnitude is rated low. The duration is rated temporary. While the impervious surfaces would persist from construction to decommissioning, the impacts would be limited to periods of heavy rainfall events, which typically occur in the spring and fall months. The likelihood is rated unlikely. The spatial extent is rated local because, during peak flows, runoff from the site could be transported beyond the Project Lease Boundary.
- **Introduction of Hazardous Substances**: Impacts from the introduction of hazardous substances are rated negligible during Project operations. Impacts from hazardous substances are rated temporary in duration. The likelihood is rated unlikely, and the spatial extent is rated limited.
- **Impacts on Public Water Supply**: Impacts on public water supply would be a direct impact. The magnitude is rated low for Turbine Option 1 and Option 2. The duration of impact is rated temporary as impacts are most likely during periods of drought or water shortage. The likelihood is rated feasible. The spatial extent is rated regional because impacts on local water supply would affect the broader region.

Solar Arrays

- **Panel Washing**: The magnitude of the impact from panel washing is rated negligible magnitude. Impacts are rated negligible because if infiltration does not occur under the solar panels, interception by vegetation and infiltration in the surrounding area would be anticipated prior to water reaching a stream. Vegetated strips would minimize the potential for soil erosion and mobilization of sediments as surface water runoff and would help trap sediment prior to entering streams. The duration for impacts is rated temporary as solar panel washing would occur only once per year. The likelihood is rated unlikely because water is expected to infiltrate the ground (Horse Heaven Wind Farm, LLC 2022). The spatial extent is confined to the Lease Boundary.
- **Surface Water Runoff from Impervious Surfaces**: No impacts are anticipated, and no further assessment is required.
- **Introduction of Hazardous Substances**: Impacts on water resources are not anticipated, and no further assessment is required.
- **Impacts on Public Water Supply:** Operation of the Project would have a direct impact on public water supply. The magnitude is rated low. The duration would be temporary as impacts would only be anticipated during drought or water shortage. The likelihood is rated feasible. Water for the O&M facilities would be required. Panel washing may be required once per year to optimize the performance and efficiency of the solar panels. The spatial extent would be regional because if impacts on local water supply occurred, this would affect the broader region.

Battery Energy Storage Systems

- **Surface Water Runoff from Impervious Surfaces:** No impacts are anticipated, and no further assessment is required.

- **Introduction of Hazardous Substances:** Impacts on water resources are not anticipated, and no further assessment is required.
- **Impacts on Public Water Supply:** Impact ratings are identical to the turbines because the BESS would still require O&M facilities. The magnitude of impact from BESS operations on public water supply is rated low and the duration of impact is rated temporary. The likelihood is rated feasible, and the spatial extent is rated regional.

Substations

- **Surface Water Runoff from Impervious Surfaces:** Impacts on surface water runoff from impervious surfaces associated with the operation of the substations is not anticipated, and no further assessment is required.
- **Introduction of Hazardous Substances:** Impacts on surface waters, floodplains, and groundwater from the introduction of hazardous substances from the operation of substations is not anticipated, and no further assessment is required.
- **Impacts on Public Water Supply:** Impact ratings are identical to the turbines because the BESS would still require O&M facilities. The magnitude is rated low, and the duration of impact is rated temporary. The likelihood is rated feasible, and the spatial extent is rated regional.

Comprehensive Project

- **Panel Washing**: The impact of panel washing from the comprehensive Project is identical to the solar arrays, as these are the only components that require panel washing. The magnitude of the impact is rated negligible. The duration is rated temporary. The likelihood is rated unlikely because water is expected to infiltrate the ground (Horse Heaven Wind Farm, LLC 2022). The spatial extent is rated confined to the Lease Boundary.
- **Surface Water Runoff from Impervious Surfaces**: Impervious surfaces from the Project would be concentrated in the Micrositing Corridor. Impact ratings for the comprehensive Project are identical to the wind turbines. The impact of increased surface water runoff from impervious surfaces is rated low. The duration is rated temporary. The likelihood is rated unlikely. The spatial extent is rated local.
- **Introduction of Hazardous Substances**: Impacts from the introduction of hazardous substances are rated identical to the wind turbines. Impacts are rated negligible during Project operations with mitigation measures such as carrying spill equipment in all vehicles. Impacts from hazardous substances are rated temporary in duration. The likelihood is rated unlikely, and the spatial extent is rated limited.
- **Impacts on Public Water Supply**: Impacts from public water supply are identical to ratings for the solar arrays and consider both O&M facilities and panel washing. The magnitude is rated low and the duration is rated temporary. The likelihood is rated feasible, and the spatial extent is regional.

4.4.2.3 Impacts during Decommissioning

Impacts during Project decommissioning would be similar to impacts during construction (Section 4.4.2.1). Decommissioning would require temporary disturbance areas to facilitate the removal of Project components including the wind turbines, solar arrays, substations, BESS, roads, transmission lines, and O&M facilities resulting in physical disturbance that could impact water resources. It is assumed that the same area of temporary disturbance that would be required during construction would also be required during decommissioning. Permanent disturbance areas would be restored during Project decommissioning.

Potential impacts on water resources from Project decommissioning include:

- Physical disturbance to facilitate decommissioning
- Change in water quality
- Increase in surface runoff
- Change in hydrology of ephemeral and intermittent streams
- Introduction of hazardous substance

Impact Description

Physical Disturbance

Surface Water and Wetlands

The ASC identifies 31 ephemeral streams and two intermittent streams that intersect the Micrositing Corridor and Solar Siting Areas. Like construction, Project decommissioning would require temporary disturbance of 19 ephemeral streams and both intermittent streams. No permanent disturbance is anticipated during Project decommissioning.

The physical disturbance from temporary disturbance would be a direct impact on surface water. All disturbance of surface water would occur within the Micrositing Corridor; therefore, Turbine Option 1 and Option 2 were assessed separately from the other Project components.

No impacts relating to physical disturbance to ephemeral or intermittent streams or wetlands would occur within the Solar Siting Areas, BESS, or substations. Assessment of impacts from the comprehensive Project would be the same as impacts from Turbine Option 1 and Option 2, as the only impacts from physical disturbance would occur within the Micrositing Corridor.

Runoff/Absorption

Project decommissioning would also result in loss or reduction of runoff and absorption capacity within the Lease Boundary. Site clearing to provide temporary access routes for decommissioning would remove vegetation and soils that act to intercept water and aid in water infiltration. Physical disturbance of vegetation and soils during Project decommissioning could increase surface runoff, resulting in the potential for increased erosion and sedimentation of surface water. In total, Project decommissioning would result in an estimated 2,957 acres of temporary disturbance, as described in Tables 2.1-1 and 2.1-2 of Chapter 2.

Temporary disturbance areas would be revegetated following decommissioning, restoring absorption capacity. Areas of permanent disturbance would also be returned to pre-disturbance conditions by removing Project infrastructure and revegetating, restoring runoff and absorption capacity.

Project decommissioning would have an indirect impact on runoff and absorption capacity. Removal of the permanent disturbance features such as wind turbine footings, would remove impervious ground in the Lease Boundary and would be a benefit to the area.

Floodplains

Approximately 0.8 acres of land within the 100-year floodplains/Frequently Flooded Areas, which are associated with CARAs, occur within disturbance areas of the Micrositing Corridor. These are associated with transmission line. Proposed mitigation would include spanning the 100-year floodplain to avoid temporary disturbance as described in Section 4.4.2.1. Therefore, Project decommissioning would also not require site clearing.

Physical disturbance of floodplains from the solar arrays, BESS, and substations would not occur during Project decommissioning; therefore, impacts are not assessed further. The physical disturbance of floodplains from the comprehensive Project would be the same as within the Micrositing Corridor as this would be the only location where floodplains would be impacted.

Groundwater

Project decommissioning would result in the temporary disturbance of 1.6 acres of alluvial soils associated with CARAs (Horse Heaven Wind Farm, LLC 2022). While groundwater would not be directly impacted, it could be indirectly impacted through loss of associated alluvial soil. Less than 1 percent of alluvial soils within the Lease Boundary would be disturbed during Project decommissioning. The temporary disturbance of 1.6 acres of alluvial soils within the Micrositing Corridor would be considered an indirect impact on groundwater resources.

No other Project components would result in physical disturbance to groundwater resources; therefore, the impacts would be negligible and are not assessed further. Impacts that would result from the comprehensive Project would be the same as impacts from within the Micrositing Corridor.

Water Quality

Surface Water

Project decommissioning activities such as clearing and soil stockpiling for temporary access could result in impacts on water quality. Impacts on surface water quality could occur where construction activities interact with ephemeral and intermittent streams. Impacts on surface water quality would be similar to those discussed in Section 4.4.2.1 for Project construction.

Only the Micrositing Corridor would require temporary disturbance of surface water for construction, and it is therefore assumed that this same area would be required during the decommissioning stage of the Project. The temporary disturbance of ephemeral and intermittent streams would have the potential to impact water quality. Impacts on water quality from within the Micrositing Corridor are considered a direct impact.

In addition, ephemeral stream channels were identified in the East Solar Field and Sellards Solar Field as described in Section 3.4, Table 3.4-2. While these stream channels would not be directly disturbed, there is potential that decommissioning could impact water quality within the channels through runoff. These two solar fields would have a direct impact on water quality.

No streams or wetlands would occur within the County Well Solar Field, BESS, or substations sites; therefore, impacts on water quality from Project decommissioning would not be expected and are not assessed further. Impacts of the comprehensive Project are rated the same as Turbine Option 1 and Option 2, as this incorporates the area of greatest potential impact.

Hydrology

Surface Water

The impacts of Project decommissioning on the hydrology of ephemeral and intermittent streams would be similar to the temporary disturbance during Project construction, as discussed in Section 4.4.2.1. No permanent disturbance would occur during Project decommissioning. The removal of the culvert on the intermittent stream within the Micrositing Corridor during decommissioning should restore the stream hydrology.

Where Project decommissioning would impact ephemeral and intermittent streams, there would be potential for impacts on hydrology. For Project decommissioning, it is assumed that this would be required within the Micrositing Corridor, similar to the construction stage of the Project. Project decommissioning would have a direct impact on hydrology within the Micrositing Corridor.

Decommissioning of the solar arrays, BESS, and substations would not result in temporary disturbance of ephemeral and intermittent streams; therefore, no impacts are anticipated, and the Project components are not assessed further. The impacts from the comprehensive Project would be the same as those within the Micrositing Corridor.

Introduction of Hazardous Substance

Surface Water

Hazardous substances required for Project decommissioning would be similar to those required for Project construction. The potential impacts and sources are discussed in Section 4.4.2.1. Impacts of the introduction of hazardous substances on surface water are rated separately within the Micrositing Corridor from other Project components because Project decommissioning would require temporary disturbance within ephemeral and intermittent streams within the Micrositing Corridor. For all Project components, the introduction of hazardous substances would be a direct impact.

Floodplains

Project decommissioning could result in a spill of a hazardous substance that has the potential to impact floodplains. Impacts of spills on floodplains and their sources are discussed in Section 4.4.2.1. Accidental release of hazardous substances could occur for any Project component, but only the Micrositing Corridor would have the potential to impact floodplains in the Lease Boundary. Accidental release of hazardous substances would be a direct impact.

The solar arrays, substations, and BESS do not overlap with floodplains, and impacts from an accidental spill are not anticipated. These Project components are not assessed further. The impacts of the comprehensive Project are rated the same as within the Micrositing Corridor.

Groundwater

Project decommissioning could result in the introduction of hazardous substances, although this would be unlikely to impact groundwater, for the reasons discussed in Section 4.4.2.1. Diesel products and hydrocarbons range in their chemical composition. Diesel and other hydrocarbon products readily penetrate porous substances such as soil (API 2016). The movement of hazardous substances through porous soil would have the potential to impact groundwater. If hazardous substances were to contact groundwater, there would be potential impacts on water quality, water chemistry, and downstream areas. The greatest area of potential for an impact would be areas of alluvial soils associated with CARAs within the Micrositing Corridor.

Depth to water in the Lease Boundary averages 184 feet. As noted above, sources for accidental spills are anticipated to be small point sources, and spill response equipment would be available on site. The effectiveness of on-site spill response equipment would largely depend on the training of the Applicant's contractors conducting the decommissioning activities. It is not anticipated that decommissioning of any Project components would result in a spill that impacts groundwater, and this impact is not assessed further.

Impacts on Public Water Supply during Drought or Water Shortage

Estimates of water supply required for Project decommissioning are not provided in the 2022 ASC. However, the total amount of water required per year during decommissioning is anticipated to be less than for Project construction, which is estimated to be 120 million gallons per year (Horse Heaven Wind Farm, LLC 2022). This is because certain activities, such as concrete pouring, would not be required during decommissioning. However, some activities, such as fugitive dust control, would still require water. Prior to Project decommissioning, the Applicant would provide EFSEC with an estimate of the amount of water required for all decommissioning activities.

Turbine Option 1 and Turbine Option 2

- **Physical Disturbance**: The impact of physical disturbance on water resources is rated low magnitude. The duration is rated short term as the disturbance areas would be returned to pre-disturbance conditions following decommissioning. The likelihood is rated unavoidable. While temporary disturbance areas would be required for decommissioning, mitigation measures would reduce the likelihood of impact. The spatial extent is rated confined within the Lease Boundary, due to the size of temporary disturbance required to remove the wind turbines.

- **Water Quality**: Impacts on water quality are rated low magnitude. The duration of impact is rated as temporary as the impact would only affect water quality if water were present in the streams. The likelihood of impacts is rated as unlikely, as mitigation measures would minimize the risk. The spatial extent of the impact would be local because impacts on water quality could impact downstream environments outside the Lease Boundary.

- **Hydrology**: Impacts on hydrology are rated low as areas of permanent disturbance and temporary disturbance would be restored to pre-disturbance conditions. The duration of the impacts is rated short term. The likelihood of impacts is rated as unlikely because of proposed mitigation measures. The spatial extent would be limited to a small area of the Lease Boundary where the Micrositing Corridor intersect ephemeral and intermittent streams.

- **Introduction of Hazardous Substances**: Impacts from the introduction of hazardous substances are rated low magnitude. The duration would be temporary as effective mitigation measures and spill response equipment on site could quickly address a spill, provided that site personnel are trained on, and equipped to perform, deploy and use spill response equipment. The likelihood is rated as unlikely. The spatial extent has the potential to be local and extend beyond the Lease Boundary during high-rainfall events or the wet season.

- **Impacts on Public Water Supply**: The impact on water supply would be direct. Impacts are rated as low magnitude. The duration would be temporary as water would be required for decommissioning, but impacts would only be anticipated during drought or water shortage. The likelihood is rated as unlikely as adjustments to schedule for the decommissioning activities could alleviate demand on public water supply. The spatial extent is regional as potential for impacts on public water supply could impact the regional scale.

Solar Arrays

- **Physical Disturbance**: The impact from physical disturbance during decommissioning is rated low magnitude. Areas of modified habitat under the solar arrays would require disturbance, including vegetation clearing and soil disturbance, to remove the solar arrays. This could impact absorption capacity. The duration is rated short term as revegetation would occur following decommissioning. The likelihood is rated as unavoidable. The spatial extent is rated as confined.
- **Water Quality**: For the solar arrays, the impacts on water quality are rated as negligible magnitude because water would be intercepted by vegetated buffers and would likely infiltrate the ground before entering a watercourse. The duration of impacts is rated temporary as the impact would only affect water quality if water were present in the streams. The likelihood of impacts on water quality is rated as unlikely, as mitigation measures would reduce the risk. The spatial extent of the impact on water quality would be local because impacts on water quality could impact downstream environments outside the Lease Boundary.
- **Hydrology**: No impacts on hydrology are anticipated, and no further assessment is required.
- **Introduction of Hazardous Substances**: Impacts from introduction of hazardous substances are rated negligible magnitude. No work would occur directly in a stream. Any accidental release is anticipated to be small and would be contained by trained site personnel using spill response equipment. The duration would be temporary, as effective mitigation measures could address a spill quickly. The likelihood is rated as unlikely. The spatial extent would be limited as movement beyond the initial release point would not be anticipated.
- **Impacts on Public Water Supply**: The impact ratings are identical to the wind turbines. Impacts are rated low magnitude, and the duration would be temporary. The likelihood is rated as unlikely. The spatial extent is regional.

Battery Energy Storage Systems

- **Physical Disturbance**: Impacts from physical disturbance are rated low magnitude. Small areas of vegetation clearing and soil disturbance would be required to remove the BESS. The duration would be short term as soil replacement and revegetation would occur following decommissioning. The likelihood is unavoidable. The spatial extent is limited.
- **Water Quality**: There are no anticipated impacts on surface waters, and no further assessment is required.
- **Hydrology**: There are no anticipated impacts on surface waters, and no further assessment is required.
- **Introduction of Hazardous Substances**: Impact ratings are identical to the solar arrays. Impacts are rated negligible magnitude. The duration is rated temporary. The likelihood is rated as unlikely. The spatial extent is rated limited.
- **Impacts on Public Water Supply**: Impacts on public water supply are identical to those anticipated for the wind turbines. Impacts are rated low magnitude. The duration is rated temporary, and the likelihood is rated as unlikely. The spatial extent is rated regional.

Substations

- **Physical Disturbance**: Impact ratings are identical to those anticipated for the BESS. The impact from physical disturbance is rated low magnitude. The duration is rated as short term. The likelihood is unavoidable. The spatial extent is limited.
- **Water Quality**: No impacts on surface waters are anticipated, and no further assessment is required.
- **Hydrology**: No impacts on surface waters are anticipated, and no further assessment is required.
- **Introduction of Hazardous Substances**: Impact ratings are rated identical to those anticipated for the solar arrays. Impacts are rated negligible in magnitude. The duration is rated temporary. The likelihood is rated as unlikely. The spatial extent is rated limited.
- **Impacts on Public Water Supply:** Impacts on public water supply are identical to the wind turbines. Impacts are rated low magnitude. The duration would be temporary. The likelihood is rated as unlikely. The spatial extent is regional.

Comprehensive Project

- **Physical Disturbance**: Impact ratings are identical to those anticipated for the wind turbines. The physical disturbance is rated low magnitude, and the duration is rated short term. The Project would require temporary disturbance but would be revegetated following decommissioning. The likelihood is rated unavoidable, and the spatial extent is rated confined.
- **Water Quality**: Impacts on surface waters are rated low magnitude, and the duration of impact is rated as temporary. The likelihood of impacts is rated as unlikely, and the spatial extent of the impact is rated as local.
- **Hydrology**: Impacts on hydrology are rated low, and the duration of the impacts would be short term. The likelihood of impacts is rated unlikely, and the spatial extent is rated limited.
- **Introduction of Hazardous Substances**: Impacts from the introduction of hazardous substances would be identical to those anticipated for the wind turbines. The impacts are rated low, temporary, unlikely, and local.
- **Impacts on Public Water Supply**: Impacts on public water supply are rated low magnitude. Construction of the comprehensive Project was rated medium; however, less water is anticipated for decommissioning as no concrete mixing would be required. The duration is rated temporary. The likelihood is rated as unlikely, and the spatial extent is regional.

4.4.2.4 Recommended Mitigation Measures

This section describes measures that would reduce or compensate for impacts related to water resources from construction, operation, and decommissioning of the Project. EFSEC has identified the following mitigation measures for the Project to avoid and/or minimize impacts on water resources. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

W-1:[24] **Least Risk Fish Windows:** Project construction and decommissioning within ephemeral and intermittent streams would observe the least risk windows for spawning and incubating salmonoids, which are,

[24] W-: Identifier of numbered mitigation item for Water

conservatively, August 1 to September 15 for the Yakima and Columbia Rivers and their tributaries in Benton County (WDFW 2018).

Rationale: This mitigation measure addresses potential impacts on surface water and fish habitat and would minimize risk to aquatic species.

W-2: Minimize Work in Heavy Rain: Project construction and decommissioning would be minimized during rainy periods and heavy rain—in particular, work near ephemeral or intermittent streams.

Rationale: This mitigation measure addresses potential impacts of surface water and runoff and would minimize the risk of sediment release to surface water and wetlands.

W-3: Check Dams: As indicated in Ecology (2019) BMP C207E, check dams cannot be placed or used in streams unless approved by WDFW. Check dams used for work within ephemeral or intermittent streams would be approved by EFSEC in coordination with WDFW and Ecology prior to use. Stream crossing designs and associated mitigation plans would be provided and approved by EFSEC in coordination with WDFW and Ecology.

Rationale: This mitigation measure addresses the use of check dams on site, which would require approval by WDFW and Ecology prior to use.

W-4: Culvert Installation BMPs: Based on the ASC, one culvert is proposed along one intermittent stream. Installation of the culvert would follow U.S. Department of Agriculture BMPs:

- Be oriented and aligned with the natural stream channel.
- Be constructed at or near natural elevation of the streambed to avoid or minimize potential flooding upstream of the crossing and erosion below the outlet.
- Use suitable measures to avoid or minimize water from seeping around the culvert.
- Use suitable measures to avoid or minimize culvert plugging from transported debris or bedload.
- Be regularly inspected and cleaned as necessary for the life of the Project (USDA 2012).
- Cover culvert with sufficient fill to avoid or minimize damage by traffic.
- Install culverts long enough to extend beyond the toe of the fill slopes to minimize erosion.

Rationale: This mitigation measure addresses permanent impacts on ephemeral streams. It provides specifications on culvert installation to enable assessment of the potential impacts.

W-5: Employee Training: An employee training plan would be included as part of the SPCC Plan. For the duration of the Project, employees and workers on site would receive appropriate training according to the employee training plan to ensure that any spills are reported and responded to in an appropriate manner (Ecology 1999). This would include training on the use of spill response equipment and orientations identifying the location of hazardous materials, proper storage of hazardous materials, and location of spill response equipment to ensure that workers are competent in spill response.

Rationale: This mitigation measure addresses potential impacts on water quality, including sedimentation and accidental spill. Employee training reduces the risk of human error and increases confidence in the effectiveness of spill response in the event of accidents such as accidental spills.

W-6: Wetland SWPPP: A Stormwater Pollution Prevention Plan (SWPPP) would be designed specifically for work within the Micrositing Corridor adjacent to the wetland (Figure 3.4-1, Section 3.4). The SWPPP would include BMPs from the Stormwater Management Manual for Eastern Washington (Ecology 2019). The plan would include, but not be limited to, structural measures such as installation of silt fences and sediment ponds, and non-structural measures, including routine inspection and maintenance and enforcement of BMPs, to minimize surface water runoff generated from the construction activities to the wetland.

Rationale: This mitigation measure addresses potential impacts on the wetland situated near the Micrositing Corridor. The wetland is located downgradient from the construction area, so additional mitigation measures are proposed to avoid impacts.

W-7: Clear-Span 100-Year Floodplain: Clear-span the transmission line to avoid temporary disturbance to the 100-year flood plain. Site transmission line poles outside the 100-year floodplain.

Rationale: This mitigation measure addresses physical disturbance of the 100-year floodplain, a CARA.

W-8: Spill Response Equipment: Spill response equipment would be stored in every vehicle accessing the site during construction, operation, and decommissioning. In addition, an oil pan would be placed below heavy equipment when stored or not in use on site.

Rationale: This mitigation measure addresses spill response impacts by specifying locations for spill response equipment.

W-9: Minimize Water Use: During construction, operation, and decommissioning, water use would be minimized where possible. During drought or water shortage, schedule adjustment would be considered to minimize water needs on the site, where possible, or additional alternate off-site water supplies would be identified.

Rationale: The mitigation measure addresses impacts on public water supply to minimize water use on site throughout the life of the Project.

W-10: Panel Washing: During drought or water shortage, panel washing would be postponed or alternate off-site water sources could be identified to minimize impacts on public water supply. Panel wash water would be recycled and re-used where possible during operation.

Rationale: This mitigation measure addresses impacts on public water supply to minimize water use on site from panel washing, if required.

W-11: Concrete Batch Plant to Avoid Streams: Laydown areas or locations where temporary concrete batch plants will be sited should be a minimum of 100 ft from mapped streams or waterbodies.

Rationale: Siting temporary concrete batch plants outside of stream and riparian areas reduces the potential impacts off accidents and malfunctions from release of concrete wash water on water quality.

4.4.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant’s proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023b). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Siting Area size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and consider undergrounding transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[25]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary

[25] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

The location of construction laydown areas within the Lease Boundary were modified in the Final ASC and one additional laydown area was added. The construction laydown areas have been identified as locations for the concrete batch plant. Concrete wash water has elevated pH and has the potential to impact water quality. None of the laydown areas overlap known or mapped streams. **Table 4.4-3** provides the distance to the nearest stream for each of the laydown areas.

Table 4.4-3: Distance of Construction Laydown Areas to Nearest Stream

Construction Laydown Area	Distance to Nearest Stream (ft)
East Laydown - Tentative Construction Laydown Yard – Phase 1	116
East Laydown - Construction Laydown Yard – Phase 1	804
West Laydown	158

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remain. The additional Applicant commitments identified above do not change the impact ratings previously provided for water resources in the Draft EIS, and the impact ratings remain the same.

4.4.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which in turn depends on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (Washington Administrative Code 197-11-794).

This EIS weighs the impacts on water resources use that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.4-4a, 4.4-4b, and 4.4-4c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to water resources.

Table 4.4-4a: Summary of Potential Impacts on Water Resources during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Physical Disturbance	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project construction would require temporary and permanent disturbance, which could impact surface water and wetlands, surface runoff/absorption, floodplains, and groundwater.	Low	Short Term (for temporary disturbance) Long Term (for permanent disturbance)	Unavoidable	Confined	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-4:** Culvert Installation BMPs **W-6:** Wetland SWPPP **W-7:** Clear-span 100-Year Floodplain **W-11:** Concrete Batch Plant to Avoid Streams	None identified
Physical Disturbance	Solar Arrays	Project construction would require temporary and permanent disturbance, which could impact surface water and wetlands, surface runoff/absorption, floodplains, and groundwater.	Low	Short Term	Unavoidable	Confined	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-4:** Culvert Installation BMPs **W-6:** Wetland SWPPP **W-7:** Clear-span 100-Year Floodplain	None identified
Physical Disturbance	BESS Substations	Project construction would require temporary and permanent disturbance, which could impact surface water and wetlands, surface runoff/absorption, floodplains, and groundwater.	Low	Short Term (for temporary disturbance) Long Term (for permanent disturbance)	Unavoidable	Limited	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-6:** Wetland SWPPP	None identified
Change in Water Quality	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project construction could result in a change to water quality of waterways that intersect or are located adjacent to Project construction activities.	Low	Temporary	Unlikely	Local	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-5** Employee Training **W-6:** Wetland SWPPP **W-8:** Spill Response Equipment	None identified
Change in Water Quality	Solar Arrays	Project construction activities could result in a change to water quality of waterways adjacent to Project construction activities.	Negligible	Temporary	Unlikely	Local	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-5:** Employee Training **W-6:** Wetland SWPPP **W-8:** Spill Response Equipment **W-11:** Concrete Batch Plant to Avoid Streams	None identified
Change in Hydrology – Temporary Disturbance	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Temporary disturbance from Project construction within ephemeral and intermittent streams could result in changes to the hydrology of waterways.	Low	Short Term	Unlikely	Limited	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-4:** Culvert Installation BMPs	None identified
Change in Hydrology – Permanent Disturbance	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project construction would require a culvert installation on one intermittent stream that could result in changes to the hydrology of the stream.	Low	Long Term	Unavoidable	Limited	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-4:** Culvert Installation BMPs	None identified

Table 4.4-4a: Summary of Potential Impacts on Water Resources during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Introduction of Hazardous Substances	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project construction could result in the introduction of hazardous substances that could impact surface water and wetlands, floodplains, and groundwater.	Low	Temporary	Unlikely	Local	**W-7:** Employee Training **W-8:** Spill Response Equipment	None identified
Introduction of Hazardous Substances	Solar Arrays BESS Substations	Project construction could result in the introduction of hazardous substances that could impact surface water and wetlands, floodplains, and groundwater.	Negligible	Temporary	Unlikely	Limited	**W-3:** Concrete Wash-out Area **W-5:** Employee Training **W-8:** Spill Response Equipment	None identified
Public Water Supply	**Comprehensive Project**	Project construction activities would rely on water sourced from local public facilities, local private irrigators, and/or collector wells fed from regional aquifers.	Medium	Temporary	Feasible	Regional	**W-9:** Minimize Water Use	None identified
Public Water Supply	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations	Project construction activities would rely on water sourced from local public facilities, local private irrigators, and/or collector wells fed from regional aquifers .	Low	Temporary	Feasible	Regional	**W-9:** Minimize Water Use	None identified

Notes:
[(a)] The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[(b)] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[(c)] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[(d)] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Site Evaluation Council

Table 4.4-4b: Summary of Potential Impacts on Water Resources during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Panel Washing	Solar Arrays **Comprehensive Project**	Project operations would require water to wash solar array panels, which would infiltrate the surrounding ground and could impact water resources.	Negligible	Temporary	Unlikely	Confined	**W-9:** Minimize Water Use **W-10:** Panel Washing	None identified
Surface Water Runoff from Impervious Surfaces	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project operations would increase impervious surfaces, which could lead to increased water runoff to water resources.	Low	Temporary	Unlikely	Local	No mitigation identified	None identified
Introduction of Hazardous Substances	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project operations could result in the accidental release of hazardous substances that could impact water resources.	Negligible	Temporary	Unlikely	Limited	**W-5:** Employee Training **W-8:** Spill Response Equipment	None identified
Impacts on Public Water Supply	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Project operations would rely on water from public water supply for operations.	Low	Temporary	Feasible	Regional	**W-9:** Minimize Water Use **W-10:** Panel Washing	None identified

Notes:
[a] The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[d] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
EFSEC = Washington Energy Facility Siting Evaluation Council

Table 4.4-4c: Summary of Potential Impacts on Water Resources during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Physical Disturbance	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Project decommissioning would result in physical disturbance that could impact surface water and wetlands, runoff and absorption capacity, floodplains, and groundwater resources.	Low	Short Term	Unavoidable	Confined	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-6:** Wetland SWPPP	None identified
Physical Disturbance	BESS Substations	Project decommissioning would result in physical disturbance that could impact surface water and wetlands, runoff and absorption capacity, floodplains, and groundwater resources.	Low	Short Term	Unavoidable	Limited	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-6:** Wetland SWPPP	None identified
Change in Water Quality	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project decommissioning would require temporary disturbance, which could impact water quality.	Low	Temporary	Unlikely	Local	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-5:** Employee Training **W-6:** Wetland SWPPP **W-8:** Spill Response Equipment	None identified
Change in Water Quality	Solar Arrays	Project decommissioning would require temporary disturbance areas to access and remove Project components located near ephemeral and intermittent streams and could result in changes to water quality.	Negligible	Temporary	Unlikely	Local	**W-1:** Least Risk Fish Windows **W-2:** Minimize Work in Heavy Rain **W-3:** Check Dams **W-5:** Employee Training **W-6:** Wetland SWPPP **W-8:** Spill Response Equipment	None identified
Change in Hydrology	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project decommissioning would require temporary disturbance to some ephemeral and intermittent streams but would restore the disturbance areas following decommissioning.	Low	Short Term	Unlikely	Limited	**W-3:** Check Dams	None identified
Introduction of Hazardous Substances	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project decommissioning could result in the introduction of hazardous substances to water resources.	Low	Temporary	Unlikely	Local	**W-5:** Employee Training **W-8:** Spill Response Equipment	None identified
Introduction of Hazardous Substances	Solar Arrays BESS Substations	Project decommissioning could result in the introduction of hazardous substances to water resources.	Negligible	Temporary	Unlikely	Limited	**W-5:** Employee Training **W-8:** Spill Response Equipment	None identified

Table 4.4-4c: Summary of Potential Impacts on Water Resources during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Impacts on Public Water Supply	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Project decommissioning could result in impacts on public water supply.	Low	Temporary	Unlikely	Regional	**W-9:** Minimize Water Use	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
CARA = critical aquifer recharge area; EFSEC = Washington Energy Facility Siting Evaluation Council

4.4.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to water resources from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.5 Vegetation

This section describes the potential impacts on vegetation resources identified in Section 3.5 that would result from the construction, operation, and decommissioning of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) or under the No Action Alternative.

The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and shown in **Table 4.5-1**. Acreage impacts presented in this section were calculated independently from the spatial data provided by Horse Heaven Wind Farm, LLC (Applicant).

Table 4.5-1: Impact Rating Table for Vegetation from Section 4.1

Factor	Rating			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Three vegetation resources are the focus of this assessment, as described below. The term 'habitat' is used below to describe ecosystems to be in alignment with the Washington Department of Fish and Wildlife's (WDFW) terminology which uses the terms Priority Habitat (WDFW 2008, 2009) and the Application for Site Certification (ASC), which provided "habitat mapping" for the Lease Boundary.

- **Priority Habitat** - Designated by WDFW to conserve and protect identified ecosystems. Priority Habitat that may be impacted by the Project includes Eastside Steppe Priority Habitat and Shrub-steppe Priority Habitat. Habitat subtypes classified by the Applicant during field surveys considered Priority Habitat include the Eastside (interior) grassland, dwarf shrub-steppe, and sagebrush shrub-steppe. Priority Habitat has been assessed separately from other habitat because seven Priority Habitats have been identified for conservation and management by WDFW.

- **Other habitats** - Includes other vegetated areas that are not identified for conservation or management but still provide ecosystem functions such as intercepting water and sediment, contributing organic matter to soil, or providing habitat for plant species. Other habitats include the habitat subtypes rabbitbrush shrubland, non-native grassland, and planted grassland, which are not actively managed and have the potential to progress to natural ecosystems. While agriculture land may provide wildlife habitat, active vegetation management precludes it from being considered within the vegetation section. Developed and disturbed habitat subtype generally lacks vegetation and is therefore not considered a habitat for plants.
- **Potential loss of special status plant species and their habitat** - Considers known locations of special status plant species, habitat suitability mapping provided by the Applicant, and habitat descriptions available for special status plant species. A special status plant species is defined as a federally or state-listed endangered, threatened, or sensitive vascular, non-vascular, or lichen species.

Habitats provide ecosystem values and functions. To assess the magnitude of an impact on habitat, the impact must be considered within the context of the landscape. The detailed rating scale for magnitude of impacts on Priority Habitat, other habitat, and special status plant species is provided in **Table 4.5-2**.

It has been argued that there is a critical threshold at which habitat loss impacts a species' resilience, or ability to recover from a disturbance, even if it is an incremental change. Some theories propose that the reasons for this threshold are: 1) changes in the configuration of habitat affect species' ability to migrate; 2) smaller patches of habitat result in a greater amount of edge habitat, leading to habitat degradation; 3) and genetic effects become more pronounced in small populations (Swift and Hannon 2010). Studies vary widely in their conclusions regarding what the critical threshold for habitat loss may be and are dependent on the resilience of the species and habitat (Swift and Hannon 2010).

Priority Habitat is already rare within the Lease Boundary and may already be within the critical threshold for loss. Within their historic range, shrub-steppe ecosystems are estimated to be 80 percent lost or degraded (WDFW 2022). Evaluation of the magnitude of impact on Priority Habitat considered whether the impact could push Priority Habitat beyond the critical threshold for loss.

Incremental loss of agricultural land and developed/disturbed land is not considered an impact on vegetation resources. Loss of other habitat includes all other habitat except Priority Habitat (evaluated separately), agriculture land, and developed/disturbed areas. While these other habitats have been modified due to anthropogenic activities on site, they may provide suitable habitat for some native species to persist. To determine the magnitude of impact on other habitat, the impacts were evaluated to determine whether they would push the other habitat beyond a critical threshold for loss.

Table 4.5-2: Criteria for Assessing Magnitude of Impacts on Vegetation Resources

Magnitude of Impact	Description
Negligible	**Priority Habitat:** The Project would avoid impacts on Priority Habitat during siting, and degradation of Priority Habitat is not anticipated. **Other Habitat:** Impact on other habitat would be indistinguishable from existing conditions. **Special Status Plant Species:** The Project would avoid suitable or potentially suitable habitat for special status plant species.
Low	**Priority Habitat:** The Project would result in the loss of Priority Habitat, but impacts are not anticipated to alter the ecological function of the Priority Habitat. Project impacts would leave patches largely intact, with impacts concentrated on the edge, and no impact on the central core, of a Priority Habitat patch. Further degradation of habitat beyond the edges would not be anticipated. Impacts would be reversible with restoration and management. **Other Habitat:** The Project would result in loss of other habitat, but the incremental change is not anticipated to alter the composition or resilience of populations of native plants. Other habitat patches would remain connected through corridors. Increase in developed/disturbed areas would not alter the functionality of other habitat relative to existing conditions. **Special Status Plant Species:** The Project would be located in suitable habitat for special status plant species that are known to occur in the Vegetation Area of Analysis, but impacts occur in marginal habitat and avoid known populations.
Medium	**Priority Habitat:** The Project would result in a moderate loss of Priority Habitat, which may alter some ecological functions. Impacts would occur mainly on the edges of Priority Habitat patches. Further degradation of habitat would be expected and would result in a moderate degree of alteration. **Other Habitat:** The Project would result in a moderate loss of other habitat, causing fragmentation, and could impact the persistence of native plants in some patches. An increase in developed/disturbed areas would be evident from existing conditions but is unlikely to alter ecological function. **Special Status Plant Species:** The Project would impact suitable habitat for plant species at risk known to occur in the Vegetation Area of Analysis.
High	**Priority Habitat:** The Project would result in a loss of core areas of Priority Habitat, resulting in loss of ecological functions and habitat fragmentation. Further degradation of habitat would be expected from edges and extend to the core resulting in a high degree of alteration. **Other Habitat:** The Project would result in conversion of core areas of other habitat (e.g., paving). Areas of other habitat would become fragmented within the landscape, minimizing the ability for plants to disperse. Increase in impermeable surfaces would be large relative to existing conditions. **Special Status Plant Species:** The Project would directly impact a known population of special status plant species, resulting in the potential loss of a known population.

For the purpose of this section, the spatial extent of limited and confined described in **Table 4.5-1** are defined as follows, where the area can be quantified and is proportional to impacts:

- **Limited:** small areas of the Lease Boundary defined as less than 100 acres
- **Confined:** to distinguish from limited, confined is defined as greater than 100 acres but less than the total area of the Lease Boundary

Impacts on special status plant species are rated locally. Direct impacts of the loss of a subpopulation are considered confined to the Lease Boundary where disturbance is planned. However, loss of a subpopulation could result in indirect impacts at the local scale through loss of genetic diversity and vulnerability to stochastic events.

4.5.1 Method of Analysis

The study area for vegetation consists of the Lease Boundary and a 2-mile area around the Lease Boundary, referred to as the Vegetation Area of Analysis, which is consistent with the assessment area for Wildlife and Wildlife Habitat (Section 4.6). Laws and regulations for determining potential impacts on vegetation are summarized in Section 3.5, Table 3.5-1.

The habitat mapping and electronic shapefiles provided by the Applicant were used to quantify the area of net change to vegetation due to the Project for each habitat type and disturbance type unless otherwise stated. All impacts on vegetation were also assessed qualitatively, following the methods outlined in Section 4.1.

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on vegetation are discussed in Section 2.1.3 and summarized below.

The Applicant has provided the following commitments (Horse Heaven Wind Farm, LLC 2021a, 2022).

- Project facilities were sited on previously disturbed (e.g., cultivated cropland) areas to the extent feasible to avoid impacts on native habitats and associated wildlife species.
- The Project layout has evolved over time to site turbines at a greater distance from the Columbia River. In the early stages of siting, numerous steps were also taken to optimize the layout to maximize energy generation potential while minimizing impacts on resources, such as avoidance of Bureau of Land Management lands to the northwest. Noise impacts, impacts on Department of Defense radar facilities, and impacts on habitat all were considered and resulted in modification of the Project layout to reduce or avoid impacts on these resources. In addition, the Project has been designed to accommodate availability of interested landowners and availability of transmission lines with capacity to transmit power. A proposed point of interconnection with the Bonneville Power Administration (BPA) grid at Red Mountain was abandoned, primarily due to concerns associated with agricultural and viewshed interests. Early Project layouts went through multiple iterations as each of these separate factors were considered in conjunction with the others.
- More specifically with regard to habitat and vegetation, preliminary (desktop) habitat mapping was done to identify priority habitats, and to the extent possible, these were avoided in developing turbine and solar layouts. As the final design is developed, further refinement would occur to continue to reduce impacts on all resources where possible, while still meeting the Project's purpose to generate clean renewable energy.
- In general, the majority of the Project would be sited in cultivated lands; 80 percent of the Micrositing Corridor and 79 percent of the Solar Siting Areas are on developed or disturbed land. Based on the preliminary layout as presented in the ASC, within the Micrositing Corridor 85 percent of permanent disturbance would be on developed or disturbed land, while permanent disturbance to shrubland has been limited to 4 percent of the total disturbance area. The preliminary solar layout would also be primarily sited

on agriculture land to minimize disturbance to habitat and vegetation, with 84 percent of permanent and modified disturbance occurring on this habitat type.

- Because the majority of this area is already farmed where the topography is suitable, prioritizing land that would be most suitable for solar development (generally flat) results in minimizing impacts on priority habitats. However, in a few cases the highest value wind resource coincides with uncultivated land, and three wind turbines would be retained on shrub-steppe land for this reason while other sites under consideration were dropped to reduce impacts. To the extent practicable, during final design, impacts on shrub-steppe land in the western portion of the Bofer Canyon Solar Siting Areas would be minimized because this is where the majority of solar impacts on rabbitbrush shrubland occur.
- Turbines were not placed in topographic low points, drainages, or swales where shrub-steppe habitat is common. The Project layout was also revised in 2020 to minimize impacts on shrub-steppe habitat in the northeastern portion of the Project area following baseline surveys conducted in 2020. Additional leases and portions of leases were terminated to reduce the Project footprint east of the Project site along the Columbia River.
- To minimize impacts on wildlife, baseline studies were conducted for the Project consistent with the WDFW Wind Power Guidelines (WDFW 2009), the U.S. Fish and Wildlife Service's 2012 Final Land-Based Wind Energy Guidelines (USFWS 2012), the 2013 U.S. Fish and Wildlife Service (USFWS) Eagle Conservation Plan Guidance Module 1 – Land Based Wind Energy (USFWS 2013), and the USFWS 2016 Eagle Rule Revision (USFWS 2016). The Applicant used the results of these baseline studies to inform the Project's layout design to mitigate and avoid impacts on wildlife resources.
- The Project would use industry standard best management practices (BMPs) to minimize impacts on vegetation, waters, and wildlife.
- Sagebrush shrub-steppe habitat would be avoided to the extent possible. If avoidance is not possible, mitigation for impacts on sagebrush shrub-steppe habitat would be developed in consultation with the applicable agencies.
- If special status plant species are observed during preconstruction surveys, individuals and populations would be avoided to the extent possible. If avoidance is not possible, mitigation measures for impacts would be developed in consultation with the applicable agencies.
- The Applicant would limit construction disturbance by flagging any sensitive areas (e.g., wetlands, rare plant populations) and would conduct ongoing environmental monitoring during construction to ensure flagged areas are avoided.
- To minimize the impact of hazardous substances, a detailed Spill Prevention, Control, and Countermeasures Plan would be prepared by the Balance of Plant contractor and submitted to the Washington Energy Facility Site Evaluation Council (EFSEC) for review and approval. Spill kits would be stored on site at temporary and permanent locations.
- A Temporary Erosion and Sediment Control (TESC) plan would be developed and implemented, detailing specific BMPs that would be used and where they would be placed, as well as the total disturbance area. The TESC plan would include measures to prevent erosion, contain sediment, and control drainage. The TESC plan would also include installation details of the BMPs, as well as notes.

- A Stormwater Pollution Prevention Plan (SWPPP) would be developed, detailing the activities and conditions at the site that could cause water pollution, and the steps the facility would take to prevent the discharge of any unpermitted pollution.
- Clearing, excavation, and grading would be limited to the parts of the Project area where these activities are necessary for construction and decommissioning of the Project. Areas outside the construction limits would be marked in the field, and equipment would not be allowed to enter these areas or disturb existing vegetation. To the extent practicable, existing vegetation would be preserved. Where vegetation clearing is necessary, root systems would be conserved if possible.
- Vegetated areas that are disturbed or removed during construction would be restored as near as reasonably possible to pre-disturbance conditions.
- Excavated soil and rock from grading would be spread across the site to the natural grade and would be reseeded with native grasses to control erosion by water and wind.
- Silt fencing would be installed throughout the Project as a perimeter control, and on the contour downgradient of excavations, the operations and maintenance facilities, and substations.
- Straw wattles would be used to decrease the velocity of sheet flow stormwater to prevent erosion. Wattles would be used along the downgradient edge of access roads adjacent to slopes or sensitive areas.
- Mulch would be used to immediately stabilize areas of soil disturbance and during reseeding efforts.
- Jute matting, straw matting, or turf reinforcement matting would be used in conjunction with mulching to stabilize steep slopes that were exposed during access road installation.
- Soil binders and tackifiers would be used on exposed slopes to stabilize them until vegetation is established.
- Concrete chutes and trucks would be washed out in dedicated areas near the foundation construction locations. This would prevent concrete washout water from leaving a localized area. Soil excavated for the concrete washout area would be used as backfill for the completed footing to ensure that the surface soils maintain infiltration capacity.
- Watering or other fugitive dust-abatement measures would be used as needed to control fugitive dust generated during construction.
- Construction materials that could be a source of fugitive dust would be covered when stored.
- 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.
- Active dust suppression would be implemented during construction.
- A dust control plan that identifies management practices and operational procedures to effectively control fugitive dust emissions would be developed and provided to the Benton Clean Air Agency prior to construction.

- Replanting or graveling disturbed areas would be conducted during and after construction to reduce wind-blown dust.
- The Applicant does not anticipate using pesticides during Project construction or operation. If unforeseen circumstances arise that require the use of pesticides, the Applicant would consult with WDFW and EFSEC regarding use of pesticides to avoid and minimize impacts on burrowing owl (*Athene cunicularia*) (per Larsen et al. 2004).
- To the extent practicable, during final design, impacts on shrub-steppe land in the western portion of the East Solar Field would be minimized because this area contains a large portion of the rabbitbrush shrubland that would be impacted by the solar arrays.
- To minimize the impact of noxious weeds, the Applicant would implement noxious weed prevention and control as outlined in the Revegetation and Noxious Weed Management Plan (Appendix N, Horse Heaven Wind Farm, LLC 2022). The objective would be to prevent the introduction of new noxious weeds and to control the spread of noxious weeds established on site, which would be applied to construction and operation. BMPs for prevention are described in detail in Appendix N of the 2022 ASC. Control measures would include manual, mechanical, or chemical treatment of noxious weeds. The plan would also include monitoring and reporting, which would be conducted during construction and for a minimum of three years into operations by a qualified investigator.
- To minimize the impact of emergency situations, the Applicant has prepared an Emergency Response Plan (Appendix P, Horse Heaven Wind Farm, LLC 2022) that includes the procedures to follow for potential emergencies, including fire prevention and control in the event of a fire.
- A Revegetation Plan was prepared by the Applicant (Appendix N, Horse Heaven Wind Farm, LLC 2022). The following provides details of the Revegetation Plan that was considered for the impact ratings. The Revegetation Plan describes methods, success criteria, monitoring, and reporting for revegetation of areas that would be temporarily disturbed during construction of the Project. A summary of key measures presented in the Revegetation Plan is provided below.
  - Following construction, temporarily disturbed areas would be revegetated with native plant species, or non-invasive, non-persistent non-native plant species, as described in the Revegetation and Noxious Weed Management Plan. The plan calls for revegetation of agriculture land to occur in consultation with the landowner. Non-agricultural land would be seeded.
  - The Applicant provided four example seed mixes, containing native plants to the area, but the final composition of seed mixes would be determined based on preconstruction conditions and the availability of seed at the time of procurement.
  - Two grassland seed mixes and two shrub-steppe seed mixes are proposed. One seed mix corresponds to species found in the dwarf shrub-steppe, and the second corresponds to species dominant in the sagebrush shrub-steppe. One of the grassland seed mixes is specific for the modified habitat under the solar arrays and includes only low-growing grasses and forbs. The second grassland seed mix contains a combination of grasses and forbs and would be used to re-seed areas that were not previously shrub-steppe or agriculture.

- Modified habitat would be replanted under the solar arrays as described in the Revegetation and Noxious Weed Management Plan. The seed mix identified for the modified habitat includes low-growing grasses and forbs: Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Elymus elymoides*), prairie junegrass (*Koeleria macrantha*), milkvetch (*Astragalus* sp.), shaggy fleabane (*Erigeron pumilus*), and woolly plantain (*Plantago patagonica*).
- Areas that previously contained dwarf shrub-steppe would be planted with a seed mix appropriate for re-establishing dwarf shrub-steppe, and areas that previously contained sagebrush shrub-steppe would be planted with an appropriate seed mix, detailed in Appendix N of the ASC.
- Revegetation monitoring would be conducted annually for a minimum of three years except in cases where the landowner has converted the areas (e.g., to agriculture land). Following annual monitoring, a monitoring report would be prepared that would include recommendations for remedial actions, if any. Monitoring reports would be submitted to EFSEC within 60 days of the annual monitoring inspection.
- The success criteria identify trigger points that would require modifications to the Revegetation Plan based on the monitoring reports. For example, should total coverage from seeding not meet the success criteria, the environmental monitor may indicate areas that require additional seeding or soil amendments. Remedial action would be identified where the success criteria are not met by Year 3 (for revegetated grassland habitat) or Year 5 (for revegetated shrub-steppe habitat), which may include reseeding, planting with container plants, additional weed control, and other measures as needed.

■ A Habitat Mitigation Plan (Appendix L, Horse Heaven Wind Farm, LLC 2022) has been prepared consistent with the habitat offset requirements outlined in the WDFW Wind Power Guidelines (WDFW 2009). The Habitat Mitigation Plan proposes compensation ratios for temporary and permanent impacts. A summary of the habitat offset ratios is provided in **Table 4.5-3**.

Table 4.5-3: Habitat Offset Ratios Presented by the Applicant for Project Disturbance

Habitat Type	Habitat Class[a]	Temporary Disturbance Offset Ratio	Permanent Disturbance Offset Ratio	Modified Habitat Offset Ratio
Agricultural Land	Class IV	N/A	N/A	N/A
Developed/Disturbed	Class IV	N/A	N/A	N/A
Eastside (interior) Grassland (Eastside Steppe)	Class III	0.1:1	1:1	1:1
Non-native Grassland	Class III	0.1:1	1:1	0.5:1
Planted Grassland	Class III	0.1:1	1:1	0.5:1
Dwarf Shrub-steppe	Class II	1:1	2:1	2:1
Rabbitbrush Shrubland	Class II	0.5:1	2:1	2:1
Sagebrush Shrub-steppe	Class II	0.5:1	2:1	2:1

Source: Appendix K, Horse Heaven Wind Farm, LLC 2022
Note:
[a] Based on WDFW (2009) habitat classification for mitigation and the class assigned to habitat types in Appendix K, Horse Heaven Wind Farm, LLC (2022).
N/A = not applicable

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.5.2.5, Post-Adjudication Applicant Commitments.

4.5.2 Impacts of the Proposed Action

Potential impacts related to the turbines, solar arrays, battery energy storage systems (BESS), and substations may be generalized when impacts are common within the Wind Energy Micrositing Corridor or Solar Siting Areas. Where impacts on vegetation are anticipated to differ, they are broken into individual Project components. This Environmental Impact Statement (EIS) describes potential impacts specific to each proposed turbine option (represented by Option 1 or 2), solar array, or BESS where this information was available in the ASC (Horse Heaven Wind Farm, LLC 2022). For the purpose of the vegetation resources impact assessment, Project components considered are described below and acreages of impact associated with the components are presented in **Table 4.5-4**:

- **Wind Energy Micrositing Corridor**: The Micrositing Corridor includes the wind turbine towers, access roads, crane paths, laydown areas, operation and maintenance facilities, meteorological towers, collector lines, and transmission lines. The Applicant provided the areas of disturbance related to Turbine Option 1 but not to Turbine Option 2. Option 1 includes a greater number of turbines than Option 2. It is assumed that Option 2 would have the same or, potentially, fewer impacts on vegetation resources than Option 1. Therefore, only Option 1 is assessed.
- **Solar Siting Areas:** Three Solar Siting Areas are proposed. Impacts from the Solar Siting Areas are further divided into the East Solar Field, County Well Solar Field, and Sellards Solar Field where impacts are anticipated to differ. The three Solar Siting Areas differ in size based on total acreage of impact. Impacts from the Solar Siting Areas include areas under the solar arrays and within the permanent fence.
- **Substations:** Five substations are proposed. Each substation is anticipated to have the same impact on vegetation resources, so one assessment is given that applies to all substations.
- **Battery Energy Storage Systems:** Two BESS are proposed. Impacts on vegetation resources from the BESS are not anticipated to differ, so one assessment is given that applies to all BESS.
- **Comprehensive Project:** The comprehensive Project includes combined impacts from all components.

Table 4.5-4: Acres of Assessment and Disturbance for Project Components

Area	Project Components Included	Total Assessment Area (acres)	Total Disturbance Area (acres)[(a)]
Comprehensive Project	All Project Components	17,065	9,821
Micrositing Corridor	Turbine Option 1	11,845	3,356
	Turbine Option 2	11,845	NA
Solar Siting Area	East Solar Field	4,389	2,181
	County Well Solar Field	3,343	2,689
	Sellards Solar Field	3,023	2,022

Table 4.5-4: Acres of Assessment and Disturbance for Project Components

Area	Project Components Included	Total Assessment Area (acres)	Total Disturbance Area (acres)[(a)]
Battery energy storage system (BESS)	BESS adjacent to Bofer Canyon – HH-East Substation	6	6
	BESS adjacent to the Primary HH-West Step-Up Substation	6	6
	BESS adjacent to the Alternate HH-West Step-Up Substation	6	6
Substations	HH-East Substation	10	10
	Primary HH-West Intermediate Substation	4	4
	Alternate HH-West Intermediate Substation	4	4
	Primary HH-West Step-Up Substation	10	10
	Alternate HH-West Step-Up Substation	10	10

Source: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b).
Note:
(a) Includes both temporary and permanent disturbance.
NA = information not provided by the Applicant

The Wind Energy Micrositing Corridor includes the areas where turbine towers, access roads, crane paths, laydown areas, operations and maintenance facilities, meteorological towers, collector lines, and transmission lines would be developed. The ASC and the associated electronic shapefiles provided by the Applicant provide the area of disturbance related to Turbine Option 1 (Horse Heaven Wind Farm, LLC 2021b). Table 2.1-1 of Chapter 2.0, Proposed Action and Alternatives, illustrates that the temporary and permanent disturbance from turbine installation under Turbine Option 2 would be the same acreage of temporary and permanent disturbance as construction under Turbine Option 1. Turbine Option 1 would include a greater number of turbines than Turbine Option 2 and both would be sited within the same Micrositing Corridor footprint. Without the detailed design of disturbance areas for Option 2, it is assumed that the impacts from Option 2 would be similar to Option 1, and only Option 1 is assessed herein.

Impacts of the Proposed Action on vegetation resources are divided into two main categories: direct and indirect. Direct impacts result from an action that has an immediate impact on vegetation resources at the same time and place as the impact. Indirect impacts result from an action that may affect vegetation resources at a separate time or place from the initial impact. The identified impacts of the Project on vegetation resources are described below, with details provided in Sections 4.5.2.1 to 4.5.2.3.

Direct Impacts

For vegetation resources, direct impacts relate to the loss of a habitat for vegetation or a vegetative species. Assessments are provided for the loss of the extent of Priority Habitat, loss of the extent of other habitat, and loss of special status plant species.

Indirect Impacts

For vegetation resources, indirect impacts relate to the decrease in condition of a habitat or of plant species overtime. Indirect impacts to vegetation or plant species occur through degradation or fragmentation.

Degradation of Priority Habitat, other habitat, and suitable habitat for special status plant species refers to alterations of a habitat that negatively impact the plant species and ecosystem functions provided by that habitat. Degradation could occur from the following sources: introduction of hazardous substances, change in surface runoff, introduction or spread of invasive plants or noxious weeds, and deposition of dust.

Fragmentation of Priority Habitat, other habitat, and suitable habitat for special status plant species refers to impacts that further divide or separate vegetation resources. The Project could cause fragmentation of vegetation resources through the construction of roads and permanent disturbance, which could increase the risk of fire or edge effects.

4.5.2.1 Impacts during Construction

Project construction could result in both direct and indirect impacts on vegetation resources. This section describes the relationships between Project activities and their potential impacts. A summary of impact ratings is provided in **Table 4.5-12a.**

Direct Impacts

Direct impacts during construction of the Project include the loss of habitat or vegetative species due to temporary or permanent disturbance.

Loss of Habitat and Special Status Plant Species

Site clearing associated with the construction of the Project would result in direct loss of acreage associated with Priority Habitat and other habitat. Loss of Priority Habitat and other habitat is further divided into two types:

- **Temporary disturbance** is defined as habitat loss that would end when construction is complete and the area would be restored to preconstruction conditions (WDFW 2009). Temporary disturbance from Project construction would occur in equipment laydown areas, construction staging areas, some roads, and areas required for construction that would not be part of the permanent infrastructure. These areas would be revegetated once construction is complete.
- **Permanent disturbance** is defined as habitat loss that would persist throughout the life of the Project and would not be restored when construction is complete (WDFW 2009). Permanent disturbance from Project construction (which extends into operation and decommissioning) would occur in the areas of the final tower footings and associated access roads, the substations, fencing around the solar arrays, and all areas occupied by permanent structures. Permanent disturbance also includes areas identified by the Applicant as modified habitat, which includes areas within the fencing around solar arrays. The areas under and between solar arrays would be disturbed during Project construction and would be replanted following construction; however, areas under the solar arrays would not be able to support certain plant species, including tall grasses, tall forbs, and shrubs. The areas under solar arrays would be planted with a mix of low-growing forbs and grasses (Horse Heaven Wind Farm, LLC 2022). Modified habitat would extend from Project construction through to Project decommissioning, and therefore is included with permanent disturbance.

The Applicant has indicated that revegetation of temporary disturbance would be completed and has provided a proposed revegetation plan (Appendix N, Horse Heaven Wind Farm, LLC 2022). However, there is uncertainty regarding the success of restoring and revegetating shrub-steppe ecosystems, even with reseeding. While some successful seeding post-fire disturbance has resulted in sagebrush population estimates recovering to pre-fire conditions in approximately four to six years (Applestein and Germino 2021), other studies indicate that disturbance alters the population dynamics, growth, and recruitment of sagebrush that can persist for decades

(Shriver et al. 2019). Disturbance alters population size structure, particularly the size of shrubs, which is correlated to survival rate, seed production, and recruitment success (Shriver et al. 2019). Due to the uncertainty associated with the success of restoring shrub-steppe ecosystems, even temporary disturbance is rated a long-term impact due to the uncertainty and time lag associated with restoring mature and stable shrub-steppe ecosystems.

While no special status plant species were documented within the Lease Boundary (Section 3.5), the potential remains for species to be present within areas that would be required for Project construction. Special status plant species are vulnerable by nature due to specific habitat requirements, low populations, or limited habitat availability. The loss of a few individuals can have impacts on the population. The potential for impacts on special status plant species was assessed for the impact areas according to the following elements for each area:

- Type of habitat that would be impacted and that could support special status plant species
- Proximity to known locations of special status plant species

The comprehensive Project would result in approximately 2,952 acres of temporary disturbance and 6,869 acres of permanent disturbance for a combined area of approximately 9,821 acres of disturbance. Temporary and permanent disturbances were calculated independently using spatial data provided by the Applicant for the Wind Energy Micrositing Corridor, Solar Siting Areas, and comprehensive Project (Horse Heaven Wind Farm, LLC 2021b). The total acreage of each habitat subtype available within the Lease Boundary is also included for proportional analysis. To assess the impact on Priority Habitat, the proportion of Priority Habitat that would be lost by each Project component was calculated as a percentage of availability in the Lease Boundary. This was calculated by dividing the acres of disturbance within the Priority Habitat subtype from each Project component by the total Priority Habitat subtype available in the Lease Boundary. Acres of disturbance by habitat subtype can be found in **Table 4.5-5**.

Table 4.5-5: Total Acres of Habitat Types and Subtypes Identified by the Applicant for Temporary and Permanent Disturbance in the Wind Energy Micrositing Corridor, Solar Siting Areas, and Comprehensive Project in Comparison to Total Habitat Available in the Lease Boundary

Habitat Type	Wind Energy Micrositing Corridor (Turbine Option 1)		Solar Siting Areas		Comprehensive Project		Total Habitat Available in the Lease Boundary (acres)
	Temporary Disturbance (acres)	Permanent Disturbance (acres)	Temporary Disturbance (acres)	Permanent Disturbance[b] (acres)	Temporary Disturbance (acres)	Permanent Disturbance[b] (acres)	
Agriculture Land	2,263.9	391.2	200.6	5,589.5	2,323.9	5,802.8	53,450.1
Developed/disturbed	19.3	1.5	3.5	0.01	19.3	1.6	835.7
Grassland							
Eastside (Interior) Grassland (Eastside Steppe)[a]	15.3	5.4	7.9	72.5	16.2	72.5	173.5
Non-native grassland	136.0	11.5	3.2	24.7	137.3	36.1	1,635.5
Planted grassland	259.8	23.3	21.5	215.3	263.0	236.0	4,338.3
Unclassified grassland	0	0	0	0	0.01	0	6,125.2
Shrubland							
Dwarf shrub-steppe[a]	8.9	1.1	0	0	8.9	1.1	23.2
Rabbitbrush shrubland	145.0	41.6	43.8	706.1	152.3	717.2	3,037.7
Sagebrush shrub-steppe[a]	31.4	1.1	2.8	0.3	31.4	1.4	1,372.0
Unclassified shrubland	0	0	0	0	<0.01	0	1,436.6
Total	**2,879.6**	**476.7**	**283.3**	**6,608.41**	**2,952.32**	**6,868.7**	**72,427.8**

Source: Horse Heaven Wind Farm, LLC 2021b

Notes: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b). Sum of the acres within disturbance areas of the Micrositing Corridor and Solar Siting Areas will not equal the comprehensive Project due to overlapping areas. Disturbance areas were only provided for Turbine Option 1. It is assumed that the area required for Turbine Option 2 is equal to or less than Turbine Option 1 (fewer turbines), so Turbine Option 1 presents the worst-case scenario.

(a) Washington State Department of Fish and Wildlife Priority Habitats

(b) Permanent disturbance includes the areas of permanent disturbance and modified habitats described by the Applicant. The modified habitats are areas under and between the solar arrays that would be planted with low-growing native grass and forbs; the vegetation will be restricted to only low-growing species because of the solar arrays.

Table 4.5-6 provides the acreages by habitat subtype for each Solar Siting Area that would be disturbed during Project construction as either temporary disturbance or permanent disturbance. Differences in impacts would be anticipated among the three Solar Siting Areas due to differential impacts on Priority Habitat, so they are assessed individually. A summary of the impacts that construction within the Solar Siting Areas could have on Priority Habitat, other habitat, and special status plant species is provided below. Because Priority Habitats are considered more likely to provide suitable habitat for special status plant species, the assessment is expected to differ among the Solar Siting Areas.

For all Solar Siting Areas, modified habitat, which is accounted for as part of the permanent disturbance, is assessed as a long-term impact because the vegetation under and between the solar arrays would remain “modified” for the duration of the Project. Low-growing grasses and forbs would be planted under the solar arrays following construction, which may offer some habitat for certain species; however, the modified habitat would not be conducive to shrubs and tall grasses (Horse Heaven Wind Farm, LLC 2022). In addition, shading and runoff from solar panels could create altered microhabitats in the areas under and adjacent to the panels (Tanner et al. 2020). Some native plants may not be able to survive in these conditions and the introduction of greater moisture may facilitate the growth of invasive plants. Furthermore, the area would be fenced and would not be accessible to some wildlife species, which could impact seed dispersal (Horse Heaven Wind Farm, LLC 2022).

Loss of other habitat is provided as the total acres of loss and as a percentage for each Project component. Other habitats include the subtypes non-native grassland, planted grassland, rabbitbrush shrubland, unclassified grassland, and unclassified shrubland. To determine the percent loss of other habitat, the temporary and permanent disturbance acres were divided by the total availability of other habitat within the Lease Boundary. A summary of the percentage of temporary and permanent disturbance that would result from each Project component to other habitat is provided in **Table 4.5-7**.

Table 4.5-6: Habitat Types and Subtypes in the Solar Siting Areas

Habitat Type	East Solar Field		County Well Solar Field		Sellards Solar Field	
	Temporary Disturbance (acres)	Permanent Disturbance[b] (acres)	Temporary Disturbance (acres)	Permanent Disturbance[b] (acres)	Temporary Disturbance (acres)	Permanent Disturbance[b] (acres)
Agriculture Land	85.6	1,075.1	30.0	2,580.4	85.0	1,934.0
Developed/Disturbed	2.7	<0.01	0.2	0	0.6	0
Grassland						
Eastside (Interior) Grassland[a]	7.9	72.5	0	0	0	0
Non-native Grassland	2.9	21.6	0.1	3.0	0.2	0
Planted Grassland	19.8	140.3	1.3	73.7	0.4	1.2
Shrubland						
Dwarf Shrub-steppe[a]	0	0	0	0	0	0
Rabbitbrush Shrubland	43.8	706.1	0	0	0	0
Sagebrush Shrub-steppe[a]	2.5	0.3	0	0	0.3	0
Total	**165.2**	**2,015.9**	**31.6**	**2,657.1**	**86.5**	**1,935.2**

Source: Horse Heaven Wind Farm, LLC 2021b

Notes: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b).

(a) Washington State Department of Fish and Wildlife Priority Habitats

(b) Permanent disturbance includes the areas of permanent disturbance and modified habitat described by the Applicant. The modified habitats are areas under and between the solar arrays (i.e., within the fence line) that would be planted with low-growing native grass and forbs; the vegetation would be restricted to only low-growing species because of the solar array.

Table 4.5-7: Percent Impact of Other Habitat Types by Project Component for Temporary and Permanent Disturbance

Project Component	Temporary Disturbance (acres)	Temporary Disturbance (% Loss)[a]	Permanent Disturbance (acres)	Permanent Disturbance (% Loss)[a]
Turbine Option 1 and Option 2	540.8	3.3 %	76.4	0.5 %
East Solar Field	66.5	0.4 %	868	5.2 %
County Well Solar Field	1.4	<0.1 %	76.7	0.5 %
Sellards Solar Field	0.6	<0.1 %	1.2	<0.1 %
BESS	0	0 %	0	0 %
Substations	0.1	<0.1 %	1.6	<0.1 %
Comprehensive Project	552.6	3.3 %	989.3	6.0 %

Source: Horse Heaven Wind Farm, LLC 2021b

Notes: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b). The sum of all Project components does not equal the comprehensive Project due to overlapping areas among Project components.

[a] Percentage of other habitat types impacted from Project components was calculated by dividing the sum of temporary or permanent disturbance from each Project component by the availability in the Lease Boundary. Other habitats include non-native grassland, planted grassland, rabbitbrush shrubland, unclassified grassland, and unclassified shrubland. Calculations of habitat areas were completed independently using spatial files provided by the Applicant.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

Introduction of Hazardous Substance

The introduction of hazardous substances to the environment could occur in the event of an accidental spill, which could impact vegetation in multiple ways. Hazardous substances identified by the Applicant that may be stored or used during construction or operation of the Project include synthetic lubricating oil, glycol-water mix, transformer mineral oil, hydraulic fluid, and diesel fuel. Hazardous substances could cause direct mortality, loss of vigor, and increased susceptibility to pathogens in plants. Impacts could be long term if soil chemistry is altered. During Project construction, the introduction of hazardous substances would be associated with the following activities:

- Refueling vehicles and equipment (e.g., oil, diesel fuel)
- Vehicle and equipment maintenance (e.g., oil leak)
- Concrete-mixing for foundations and pads

These construction activities would be required for all Project components.

Surface Runoff

Surface runoff from areas disturbed by the Project (i.e., exposed soil) could contain suspended soils, which could impact soil quality and vegetation. Low levels of sedimentation are not expected to impact vegetation resources; however, high sedimentation levels have the potential to influence the physical and chemical parameters of soil, which may impact ecosystem function and vegetation quality in habitat adjacent to the Project. Sedimentation can reduce photosynthesis and repress the growth of plants. In addition, the Project is anticipated to increase the area of impermeable surfaces in the Lease Boundary, which may increase surface runoff. During construction, surface runoff would be associated with the following activities:

- Clearing and grading the site
- Excavating soil
- Stockpiling soil
- Constructing site roads, laydowns, turnaround areas, and crane pads
- Constructing the foundations for turbine posts and solar array tracking system
- Areas in early stages of revegetation following disturbance

These construction activities would be required for all Project components. It is not anticipated that any of the Project components would have a greater impact on vegetation from surface runoff, relative to each other.

Introduction or Spread of Invasive Plants or Noxious Weeds

Project construction could introduce or spread invasive plants or noxious weeds. Invasive plants and noxious weeds have been documented throughout the Lease Boundary and are described in Section 3.5. Invasive plants are often pioneering species with highly competitive traits and readily established on exposed soil. The primary vectors that could introduce or spread invasive plants and noxious weeds are vehicles and equipment. Invasive species have the potential to alter the chemical and physical properties of soil, as well as nutrient cycling (Weidenhamer and Callaway 2010), which can alter the structure and composition of native vegetation. Within shrub-steppe ecosystems, fragmentation of vegetation communities by linear features such as roads and transmission lines have created conditions that facilitate the spread of invasive species (Knick et al. 2003). Project construction would result in the following linear features, some of which would be located in Priority Habitat (Horse Heaven Wind Farm, LLC 2022):

- approximately 138.1 miles of roads and crane paths
- approximately 2.8 miles of access roads for meteorological towers
- approximately 46.5 miles of transmission lines
- approximately 285.4 miles of underground collector lines

Construction of all Project components could introduce or spread invasive plants and noxious weeds. The assessment of impacts from the introduction or spread of invasive plants or noxious weeds is provided in **Table 4.5-12a**. Introduction and spread of invasive plants or noxious weeds would be minimized through the implementation of the Noxious Weed Control Plan (Appendix N, Horse Heaven Wind Farm, LLC 2022) and the mitigation measures proposed in the 2022 ASC.

Deposition of Dust

Project construction could increase ambient dust from site preparation and clearing activities, which would then be deposited in the surrounding vegetation. Dust deposition could affect the quality and quantity of vegetation adjacent to construction areas. Dust can coat vegetation and cause adverse effects on vegetation growth, block stomata, reduce photosynthesis, and affect plant vigor (Farmer 1991).

Dust from Project construction could be generated during site preparation, excavating, and concrete works and from increased vehicle and equipment access on roads. In addition, vehicles and equipment accessing the site on gravel roads could generate dust. Vehicles would require access in subsequent stages for operations and maintenance and Project decommissioning. These activities would be applicable to all Project components. It is anticipated that all Project components would have approximately equivalent impacts from dust generation. The assessment of impacts for the deposition of dust is provided for the following Project components and Project component areas: Wind Energy Micrositing Corridor, Solar Siting Areas, substations, and BESS (**Table 4.5-12a**).

Habitat Fragmentation

Fire

Project construction could increase the risk of fire, particularly during hot, dry conditions. Wildfires have become more commonly human-caused than natural (WDFW 2011). As described in Section 3.13.2, Benton County has a high potential for wildfire. Activities associated with construction that could increase the risk of fire include brush clearing, improper vehicle or equipment staging, and improper storage of flammable products, such as diesel for vehicles. In addition, workers on site could accidentally cause a fire in dry conditions, such as through improper disposal of cigarettes. Certain species within the Lease Boundary may further increase the risk—e.g., cheatgrass, a common invasive plant in the area. Relative to native vegetation, cheatgrass dries earlier in the season and can change fire intensity levels and fire return intervals and lengthen wildfire risk beyond the natural season (WDFW 2011).

Impacts from fire on individual plants include tissue damage and mortality. Plant species vary in their tolerance to fire. Rabbitbrush (*Chrysothamnus viscidiflorus*) is a fire-tolerant species and readily sprouts post-fire. Conversely, big sagebrush (*Artemisia tridentata*) is a fire-intolerant species and is slow to recover following wildfire events (USGS 2018). Big sagebrush is an indicator species for sagebrush shrub-steppe, while high cover of rabbitbrush represents an early seral stage of shrubland. Decreased time intervals between fire events may limit the re-establishment of later successional species such as big sagebrush.

At a larger scale, fire could impact and alter vegetation communities in combination with other indirect effects. While fire is a natural component of the ecosystem, it may be detrimental in areas of fragmented native ecosystems. Where shrub-steppe and native grasslands are fragmented, fire could burn through the remnant patch. Given the landscape, there is limited adjacent shrub-steppe habitat within the Lease Boundary or Vegetation Area of Analysis to provide a source of seeds for natural revegetation. Fires in warm and dry climates, where adjacent seed sources are lacking, recover slowly and may require seeding (USGS 2018). Areas affected by fire may provide opportunities for invasive plants to establish or spread before native vegetation has recovered, particularly where invasive plants are already common on the landscape.

In addition, vegetation and detritus intercept water before it reaches the soil, which helps slow water contacting soil and enables greater infiltration (Moench and Fusaro 2012). Plant roots also help to anchor soil in place, but, once dead, plant roots no longer provide this ecosystem function. If a fire impacts a large area of vegetation, there could be greater exposed soil and increased risk of water mobilizing sediments into streams and other water sources, resulting in sedimentation.

Turbine Option 1 and Option 2

A summary of the impacts that construction within the Wind Energy Micrositing Corridor (Turbine Option 1 or Option 2) could have on habitat and special status plant species is provided below (Horse Heaven Wind Farm, LLC 2022; Appendix K, Horse Heaven Wind Farm, LLC 2022). Areas of temporary and permanent disturbance were provided by the Applicant for Turbine Option 1 but have not been provided for Turbine Option 2. Turbine Option 1 includes a greater number of wind turbines and access roads. As the detailed design for the Project is not complete, the disturbance areas for Turbine Option 1 were assessed for both Turbine Option 1 and Option 2 as a worst-case scenario.

Direct Impacts

Direct impacts during construction of the turbines include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

The temporary disturbance and permanent disturbance of Priority Habitat are provided in **Table 4.5-8**.

Table 4.5-8: Loss of Extent of Priority Habitat - Micrositing Corridor

	Temporary Disturbance (acres)	Temporary Disturbance (percent of total disturbance)	Permanent Disturbance (acres)	Temporary Disturbance (percent of total disturbance)
Eastside (interior) grassland[a]	15.3	9 %	5.4	3 %
Dwarf shrub-steppe[b]	8.9	38 %	1.1	5 %
Sagebrush shrub-steppe[b]	31.4	2 %	1.1	<1 %

Source: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b).
Notes:
[a] Part of the Eastside Steppe Priority Habitat
[b] A subtype of Shrub-steppe Priority Habitat
N/A = not applicable

Loss of extent of Priority Habitat is rated high magnitude for temporary disturbance as there would be greater than 10 acres of impact on Priority Habitat and greater than 20 percent of impact for dwarf shrub-steppe Priority Habitat. A total of 38 percent (8.9 acres) of dwarf shrub-steppe habitat subtypes known to occur in the Lease Boundary would occur within temporary disturbance areas identified for the Micrositing Corridor. A total of 9 percent (15.3 acres) of Eastside (interior) grassland would occur in temporary disturbance areas for the Micrositing Corridor. This degree of loss could impact the ecological functions provided by Priority Habitat. Infrastructure such as wind turbines and roads would impact the core of some habitat patches and result in habitat fragmentation. The duration of loss of extent of Priority Habitat is rated long term for temporary disturbance because of the uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as unavoidable because the Applicant has identified these areas as temporary and permanent disturbance areas that would be required for Project construction. The spatial extent would be less than 100 acres, and so is rated as limited within the Lease Boundary.

Loss of extent of Priority Habitat is rated low magnitude for permanent disturbance. Less than 10 acres of Priority Habitat is proposed to be permanently disturbed. Permanent disturbance is mainly concentrated around Priority Habitat edges, except permanent disturbance within the dwarf shrub-steppe Priority Habitat, which may impact some core habitat. The duration of loss of extent of Priority Habitat is rated as long term for permanent disturbance, as habitats in these areas would be lost from construction through to decommissioning but would be revegetated following decommissioning. In addition, there is uncertainty associated with the success of revegetation and the time lag associated with restoring mature shrub-steppe. The likelihood is rated as unavoidable because the Applicant has identified these areas as temporary and permanent disturbances that would be required for Project construction. The spatial extent would be less than 100 acres and is rated as limited within the Lease Boundary.

Loss of Extent of Other Habitat

Loss of extent of other habitat is rated low magnitude for temporary disturbance as construction would temporarily impact 3.3 percent of other habitat in the Lease Boundary. The duration is rated as short term for temporary disturbance. The likelihood is rated unavoidable because the Applicant has identified these areas would be required for Project construction. The spatial extent would be greater than 100 acres so is rated confined within the Lease Boundary.

Loss of extent of other habitat is rated negligible magnitude for permanent disturbance as construction would permanently impact less than 1 percent of other habitat in the Lease Boundary. The duration is rated long term for permanent disturbance. The likelihood is rated as unavoidable because the Applicant has identified these areas would be required for Project construction. The spatial extent would be less than 100 acres, so is rated limited within the Lease Boundary.

Loss of Extent of Special Status Plant Species

While the majority of the area within the Micrositing Corridor is classified as agriculture, all three Priority Habitats known to occur within the Lease Boundary would be impacted within the Micrositing Corridor. Priority Habitats contain native vegetation with varying degrees of disturbance. Special status species associated with Shrub-steppe Priority Habitat and Eastside Steppe Priority Habitat would have increased potential for occurring where the Micrositing Corridor overlaps with the Priority Habitats.

The habitat suitability mapping for woven spore lichen (*Texosporium sancti-jacobi*) provided by the Applicant identified 18.9 acres of potentially suitable habitat within the Micrositing Corridor, and four occurrences of the lichen are known to occur within 3 miles of the Lease Boundary (Appendix K, Horse Heaven Wind Farm, LLC 2022). The nearest known location of woven spore lichen is located within 0.6 miles north of the Micrositing Corridor.

A summary of the impact ratings is provided in **Table 4.5-12a**. Loss of extent of special status species is rated medium magnitude as impacts would occur in 18.9 acres of suitable habitat for woven spore lichen. Impacts are anticipated to be at least partially reversible with restoration. The duration is rated as constant, from construction through to decommissioning, and could extend beyond the life of the Project as populations of special status plant species would be difficult to recover if lost. The likelihood is rated as feasible, as special status species have not been documented, but suitable habitat occurs. In addition, surveys did not document lichens or non-vascular plants. The spatial extent of the impact is local as impacts on a special status plant species or population may affect the local population beyond the Lease Boundary. Because special status plant species are vulnerable by nature, additional impacts such as loss of a subpopulation could cause population-level impacts through reduced genetic diversity and reduced resilience to stochastic events, among other factors.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The potential exists for habitat degradation to occur during the construction of the turbines. Commitments proposed by the Applicant would meet state and county requirements for best practices, but habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust.

Accidental spills related to the construction of the Project would be small in scale and would be originating from a point source of either equipment or vehicles. The development of a Spill Response Plan would minimize the risk of spills and spill response material would be available on site.

Surface runoff is not anticipated to exceed greater than 100 acres. Vegetation resources are expected to recover easily following removal of the source of surface runoff. The development of the SWPPP and TESC plan would minimize the risk of surface runoff.

Noxious weeds and invasive plants are already common in the Micrositing Corridor, which would provide a continuous source for weeds to establish. Noxious weeds and invasive plants typically require multiple years of treatment and monitoring to control. There is a high likelihood that equipment would encounter invasive plants on site during the construction of the turbines. This could result in spreading invasive plants to work areas through soil or plant propagules, even with best practices and mitigation. In addition, the Noxious Weed Control Plan would only include treatment and monitoring for noxious weeds, not all invasive plants. Invasive plants and noxious weeds could spread beyond the initial occurrence, including the Lease Boundary, and often have traits that facilitate their dispersal and colonization.

There would be a small increase in dust-generating activities that could impact adjacent vegetation during the construction of the turbines. The arid environment increases the potential for dust-generating activities. Dust generated from the Project could be spread beyond the Lease Boundary by wind or water.

The magnitude of habitat degradation during the construction of the turbines is rated as low as sources are likely to be point sources and would not affect sensitive receptors. Habitat degradation is rated as having a long-term duration due to the potential for this impact to occur throughout the Construction Stage and for treatment and monitoring to last into operation of the Project. The likelihood is rated as feasible due to the nature of the activities, and the spatial extent would be local because the impact would have the potential to occur beyond the Lease Boundary.

Habitat Fragmentation

The impact of fire on vegetation resources is rated low magnitude because most Project activities would not have a high risk of causing fire. However, turbine installation may pose a risk due to the combustible materials and lubricants in the nacelle and diesel-powered generators that may be required. The duration is rated long term as ecosystem recovery from a fire could take several years. The likelihood is rated as feasible for the Micrositing Corridor with the application of BMPs. Combustible materials would be required during the construction of the turbines. The nacelle of turbines contains combustible materials and lubricants that may pose a risk to fire, and diesel-powered generators may be required during turbine commissioning. The spatial extent is local as fire, under the right conditions (e.g., wind and heat), could move across the landscape rapidly and have the potential to impact areas beyond the Lease Boundary.

Solar Siting Areas

Impacts from the Solar Siting Areas are assessed as direct and indirect impacts. The assessment is further divided where impacts on vegetation resources would differ between each solar field.

Direct Impacts

Direct impacts during construction of the solar arrays include the loss of extent of Priority Habitat, other habitat, and special status species for each solar field.

Loss of Extent of Priority Habitat

East Solar Field

As referenced in **Table 4.5-6**, loss of extent of Priority Habitat within the East Solar Field would impact Eastside (interior) grassland and sagebrush shrub-steppe. Disturbance related to construction would temporarily impact 4.6 percent (7.9 acres) of Eastside (interior) grassland available within the Lease Boundary and permanently impact 41.7 percent (72.5 acres). Construction of the East Solar Field would temporarily impact less than 0.1 percent (2.5 acres) of sagebrush shrub-steppe available within the Lease Boundary and permanently impact less than 0.1 percent (0.3 acres).

A summary of the impact ratings is provided in **Table 4.5-12a**. Impacts related to loss of extent of Priority Habitat from construction are rated medium for temporary disturbance. Temporary disturbance is greater than 10 acres but would primarily impact the edge of Priority Habitat. Impacts are expected to be partially reversible with revegetation; however, shrubs and tall grasses may not be feasible to plant within the solar array area. The duration is rated as long term for temporary disturbance because of the uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as unavoidable for both permanent and temporary disturbance because the Applicant has identified these areas as disturbance areas required for Project construction. The spatial extent is rated limited based on the total area of disturbance to Priority Habitat.

Impacts related to loss of extent of Priority Habitat from construction of the East Solar Field are rated high magnitude for permanent disturbance. Permanent disturbance in the East Solar Field would impact 41.7 percent of Eastside (interior) grassland, including loss of the core area in the patch, available in the Lease Boundary. Impacts may not be fully reversible. The duration is rated long term for permanent disturbance and modified habitat. In addition, there is uncertainty associated with the success of revegetation and the time lag associated with restoring mature shrub-steppe. The likelihood is rated unavoidable because the Applicant has identified permanent disturbance areas that would be required for Project construction. The spatial extent is rated limited based on the total area of permanent disturbance to Priority Habitat.

County Well Solar Field

No Priority Habitat is mapped in the County Well Solar Field.

A summary of the impact ratings is provided in **Table 4.5-12a**. Impacts from construction of the County Well Solar Field on loss of extent of Priority Habitat is rated negligible magnitude for temporary and permanent disturbance as there would be no impacts on Priority Habitat. The duration is rated long term for temporary disturbance and long term for permanent disturbance and modified habitat. The likelihood is rated as unlikely for temporary and permanent disturbance. The spatial extent is rated as limited within the Lease Boundary for temporary and permanent disturbance.

Sellards Solar Field

As referenced in **Table 4.5-6**, loss of extent of Priority Habitat within the Sellards Solar Field would impact sagebrush shrub-steppe. Disturbance related to construction would temporarily impact less than 0.1 percent (0.3 acres) of sagebrush shrub-steppe within the Lease Boundary.

Impacts related to loss of extent of Priority Habitat from construction of the Sellards Solar Field are rated low magnitude for temporary disturbance, as there would be less than 1 acre of disturbance to Priority Habitat. Adjustments during construction could avoid or further minimize the impacts on Priority Habitat. The duration is rated long term for temporary disturbance because of the uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as feasible for temporary disturbance. While the area has been identified, final siting could seek avoidance of the small area of Priority Habitat. The spatial extent is rated as limited for all disturbance types.

Impacts on Priority Habitat from permanent disturbance are rated as negligible magnitude because no impacts to Priority Habitats would occur in these disturbance areas. The duration is rated long term for permanent disturbance. The likelihood is rated as unlikely for permanent disturbance as there would be no impacts on Priority Habitats. The spatial extent is rated as limited for all disturbance types.

<u>Loss of Extent of Other Habitat</u>

East Solar Field

Impacts related to loss of extent of other habitat from construction of the East Solar Field are rated negligible for temporary disturbance. Temporary disturbance would occur to less than 1 percent of other habitat. The duration is rated as short term for temporary disturbance. The likelihood is rated as unavoidable because the Applicant has identified these areas would be required for Project construction. The spatial extent is rated as limited for temporary disturbance.

Impacts related to loss of extent of other habitat from construction of the East Solar Field are rated low magnitude for permanent disturbance. Permanent disturbance would occur to 5.2 percent of other habitat, including rabbitbrush shrubland. Modified habitat would be planted under the solar arrays, but only low-growing grasses and forbs can be planted. The structural complexity provided by the rabbitbrush shrubland would be lost from construction through to decommissioning. The duration is rated long term for permanent disturbance. The likelihood is rated as unavoidable because the Applicant has identified these areas would be required for Project construction. The spatial extent is rated confined for permanent disturbance.

County Well Solar Field

The magnitude of impact from construction of the County Well Solar Field related to loss of extent of other habitat is rated negligible for temporary and permanent disturbance as there would be less than 1 percent disturbance to other habitat for both disturbance types. The duration is rated as short term for temporary disturbance and long term for permanent disturbance. The likelihood is rated as unavoidable for temporary and permanent disturbance because the Applicant has identified these areas would be required for Project construction. The spatial extent is rated as limited.

Sellards Solar Field

Impacts related to loss of extent of other habitats from construction of the Sellards Solar Field are rated negligible magnitude for temporary and permanent disturbance. Impacts from temporary disturbance are rated short term and impacts from permanent disturbance are rated long term. The likelihood is rated as unavoidable for temporary and permanent disturbance because the Applicant has identified these areas would be required for Project construction. The spatial extent is rated as limited.

Loss of Extent of Special Status Plant Species

East Solar Field

No special status plant species have been identified in the East Solar Field; however, Priority Habitat within the East Solar Field has the potential to support some special status plant species. No suitable habitat for woven spore lichen has been identified.

A summary of the impact ratings is provided in **Table 4.5-12a**. Impacts on special status species from construction of the East Solar Field are rated medium magnitude as there would be a potential to impact special status species. While no species were documented within the East Solar Field, Priority Habitats within the East Solar Field have increased potential to support special status plants. Impacts on Eastside (interior) grassland and shrub-steppe are anticipated to be partially reversible with the establishment of modified habitat but may lack the structural complexity of tall grasses and shrubs. The duration of impacts is rated as constant during the life of the Project and/or beyond the Project. Special status species are often limited in distribution, have low tolerance of disturbance, and/or are associated with unique features. If impacted, there is a low likelihood that the population would recover. The likelihood of impacts is rated as unlikely as special status species have not been documented within the Lease Boundary. The spatial extent of the impacts is rated local.

County Well Solar Field

Habitat types within the County Well Solar Field include agriculture, developed/disturbed, planted grassland, and non-native grassland. These habitat types have a high degree of disturbance and non-native species. Special status plant species are not anticipated to occur in these habitats.

The magnitude of impact on special status plant species from construction of the County Well Solar Field is rated negligible. Special status plant species are not expected to occur because they have not been documented during surveys and there is no suitable habitat within the County Well Solar Field disturbance areas. The duration of impact is rated constant. The likelihood is rated as unlikely as there is no suitable habitat, and the spatial extent is rated local.

Sellards Solar Field

No special status plant species have been identified in the Sellards Solar Field; however, Priority Habitat within the Sellards Solar Field has the potential to support special status plant species.

Impacts on special status species from construction of the Sellards Solar Field are rated low magnitude as there would be some potential to impact special status species. No special status plant species have been documented, but there is less than 1 acre of Priority Habitat that would occur within disturbance areas of Sellards Solar Field, which is considered potential suitable habitat. The magnitude of impacts is rated low. Adjustments during construction could avoid impacts on Priority Habitat, which could reduce the magnitude. The duration is rated as constant. The likelihood of impacts is rated as unlikely as special status species have not been documented within the Lease Boundary. The spatial extent of the impacts is rated local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation (All Solar Siting Areas)

The potential exists for habitat degradation to occur during the construction of the solar arrays. Habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. The magnitude for the potential for habitat degradation is rated low. The duration is rated as long term due to the potential for some effects from the impacts to last longer than the Construction Stage of the Project. The likelihood is rated as feasible due to the Applicant's commitments and the additional mitigation measures presented, and the spatial extent is rated local to address the potential for impacts to affect areas past the Lease Boundary.

Habitat Fragmentation (All Solar Siting Areas)

Similar to the construction of the turbines, the magnitude for the potential of fire impacts is rated low, the duration is rated long term, and the spatial extent is local. The likelihood is rated as unlikely. Construction of solar arrays would not require the use of combustible materials.

Battery Energy Storage Systems

No differences in impacts are anticipated among the three proposed locations, and the three BESS are rated together in **Table 4.5-12a** (i.e., not broken out as individual BESS).

Direct Impacts

Direct impacts during construction of the BESS include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

No impacts on Priority Habitat would occur within the disturbance areas for the BESS.

A summary of the impact ratings is provided in **Table 4.5-12a**. Impacts resulting in loss of extent of Priority Habitat from construction of the BESS are rated negligible magnitude for temporary and permanent disturbance. The duration is rated long term for temporary disturbance and long term for permanent disturbance. The likelihood is rated as unlikely, and the spatial extent is rated as limited for both temporary and permanent disturbance.

Loss of Extent of Other Habitat

All three BESS would be situated on approximately 6.0 acres of agriculture land each (Section 3.5).

Impacts resulting in loss of extent of other habitat from construction of the BESS are rated negligible magnitude for temporary and permanent disturbance as impacts on other habitat would not occur. The duration of impact for temporary disturbance would be short term, and long term for permanent disturbance. Temporary and permanent disturbance are rated as unavoidable as other habitat would not be impacted due to Project siting of the BESS. The spatial extent is rated as limited.

Loss of Extent of Special Status Plant Species

The BESS are all sited in areas characterized as agriculture land. No suitable habitat for special status plant species occurs within these areas.

A summary of impact ratings is provided in **Table 4.5-12a.** The magnitude of impact of construction of the BESS on special status plant species is rated negligible. The duration is rated constant. The likelihood is rated as unlikely, and the spatial extent is local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The construction of the BESS has the potential to introduce hazardous substances, surface runoff, new or increased spread of invasive plants, and deposition of dust. As with the construction of the turbines, habitat degradation during the construction of the BESS is rated low, long-term, feasible, and local.

Habitat Fragmentation

Similar to the construction of the Turbines, the magnitude of fire impacts for the construction of the BESS is rated low, the duration is rated long term, the likelihood is rated as feasible, and the spatial extent is local.

Substations

No differences in impacts are anticipated among the five proposed locations, and the five substations are rated together in **Table 4.5-12a** (i.e., not broken out as individual substations).

Direct Impacts

Direct impacts during construction of the substations includes the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

No impacts on Priority Habitat would occur within any of the proposed substation locations.

A summary of the impact ratings is provided in **Table 4.5-12a**. The magnitude of impacts from construction of the substations related to loss of Priority Habitat is rated negligible as there are no Priority Habitats known to occur in these areas. The duration is rated as long term for temporary disturbance and long term for permanent disturbance. The likelihood is rated as unlikely as there are no known Priority Habitats. The spatial extent is rated as limited.

Loss of Extent of Other Habitat

Temporary and permanent disturbance areas by substation are provided in **Table 4.5-9**.

Table 4.5-9: Temporary and Permanent Disturbance Acres by Substation

Substation	Habitat Subtype	Temporary Disturbance (acres)[a]	Permanent Disturbance (acres)[b]
HH-East Substation	Agriculture Land	0.4	10
Primary HH-West Step-up Substation	Agriculture Land	1.0	10
Alternate HH-West Step-up Substation	Agriculture Land	0.6	10
Alternate HH-West Intermediate Substation	Agriculture Land	0.4	4
Primary HH-West Substation	Agriculture Land	0.3	2.4
	Non-native grassland	0.1	1.6

Source: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b).

Notes:

(a) Temporary disturbance areas include the perimeter of the substation. Temporary disturbance are approximate values based on the spatial files.

(b) Permanent disturbance areas include the area required for the substation.

Impacts of the substations related to loss of extent of other habitats are rated negligible magnitude for temporary and permanent disturbance as less than 1 percent of other habitat available in the Lease Boundary would be impacted. Only the Primary HH-West Substation will impact other habitat as shown in **Table 4.5-9.** The duration of impacts for temporary disturbance would be short term, and long term for permanent disturbance. This impact is rated as unavoidable as the disturbance areas would be required for construction, as indicated by the 2022 ASC. The impact is rated as limited as the substations occupy approximately 4 or 10 acres each, which constitutes a small area within the Lease Boundary.

Loss of Extent of Special Status Plant Species

The substations are all sited in areas characterized as agriculture land and/or non-native grassland. No suitable habitat for special status plant species occurs within these areas.

Impacts on special status plant species are summarized in **Table 4.5-12a.** The magnitude of impact from construction of the substations is rated negligible as there is no suitable habitat within the proposed disturbance areas for the substations. The duration is rated constant. The likelihood is rated as unlikely, and the spatial extent is local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The construction of the substations has the potential to introduce hazardous substances, surface runoff, new or increased spread of invasive plants, and deposition of dust. As with the construction of the turbines, habitat degradation during the construction of the substations is rated as low, long-term, feasible, and local.

Habitat Fragmentation

Similar to the Solar Siting Areas, the magnitude of fire impacts for the construction of the substations is rated low, the duration is rated long term, the likelihood is rated as unlikely, and the spatial extent is local.

Comprehensive Project

Impacts from construction of the comprehensive Project consider all Project components together.

Direct Impacts

Direct impacts during construction of the Project includes the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

The combined impacts from the comprehensive Project would result in direct impacts on Priority Habitat. The proportion of Priority Habitat impacted is based on the proportion of Priority Habitat disturbed compared to the total available in the Lease Boundary. The total habitat available in the Lease Boundary is presented in **Table 4.5-5**.

Impacts on Eastside (interior) grassland include 16.2 acres of temporary disturbance and 72.5 acres of permanent disturbance, which constitutes 51.1 percent of the Eastside (interior) grassland within the Lease Boundary.

Impacts on dwarf shrub-steppe include 8.9 acres of temporary disturbance and 1.1 acres of permanent disturbance, which constitutes 43.1 percent of the dwarf shrub-steppe habitat within the Lease Boundary.

Impacts on sagebrush shrub-steppe include 31.3 acres of temporary disturbance and 1.4 acre of permanent disturbance, which constitutes 3.1 percent of the sagebrush shrub-steppe habitat within the Lease Boundary.

A summary of the impact ratings is provided in **Table 4.5-12a**. Impacts from all Project components related to the loss of extent of Priority Habitat are rated as high magnitude for temporary disturbance and permanent disturbance. Impacts on Priority Habitat would be greater than 20 acres for both temporary and permanent disturbance. Impacts would occur in the core area within patches of Priority Habitat and are anticipated to lead to further habitat degradation, which may alter ecological function. The duration of impacts for temporary disturbance and permanent disturbance are rated long term. Revegetation of the site is proposed for temporary disturbance after construction following the Revegetation Plan (Appendix N; Horse Heaven Wind Farm, LLC 2022) and site restoration would occur following decommissioning (Appendix A; Horse Heaven Wind Fam, LLC 2022); however, there is uncertainty associated with revegetation success, and there would be a time lag associated with achieving mature shrub-steppe. The impacts are rated as unavoidable for temporary and permanent disturbance because the areas would be required for Project construction. The impacts are rated as limited within the Lease Boundary.

Loss of Extent of Other Habitat

Impacts from all Project components on the loss of extent of other habitat are rated as low magnitude for temporary and permanent disturbance. Temporary disturbance would result in approximately 3.3 percent loss of other habitat, and permanent disturbance would result in approximately 6.0 percent loss. The duration of impacts would be short term for temporary disturbance, and long term for permanent disturbance and modified habitat. The impacts are rated as unavoidable for temporary and permanent disturbance as the areas would be required for Project construction. The impacts are rated as confined as impacts from temporary and permanent disturbance would be greater than 100 acres each.

Loss of Extent of Special Status Plant Species

No special status species were observed within any of the areas where Project components are sited; however, Priority Habitat has the potential to support special status species. In addition, 18.9 acres of potentially suitable habitat for woven spore lichen occurs in the Micrositing Corridor (Appendix K, Horse Heaven Wind Farm, LLC 2022).

A summary of the impact ratings is provided in **Table 4.5-12a**. Impacts from all Project components resulting in the loss of extent of special status species are rated as medium for magnitude as there could be impacts on special status species. The duration of the impact is rated constant as populations of special status species would be difficult to recover if lost. The impact is rated as feasible because there is suitable habitat within areas identified for impact. The impact is rated as local because impacts would occur within the Lease Boundary.

Indirect Impacts

Habitat Degradation

The construction of the Project has the potential to introduce hazardous substances, surface runoff, new or increased spread of invasive plants, and deposition of dust. As with the construction of the turbines, habitat degradation during the construction of the comprehensive Project is rated as low, long-term, feasible, and local.

Habitat Fragmentation

Similar to the construction of the turbines, the magnitude of fire impacts for the construction of the comprehensive Project is rated low, the duration is rated long term, the likelihood is rated as feasible, and the spatial extent is local.

4.5.2.2 Impacts during Operation

Impacts on vegetation during Project operation are described below as they relate to Turbine Option 1, Turbine Option 2, Solar Siting Areas, BESS, substations, and the comprehensive Project. A summary of the impact assessment is provided in **Table 4.5-12b**.

Direct Impacts

Direct impacts during Project operations include potential loss during vegetation maintenance.

Vegetation Maintenance

During operation, vegetation maintenance would be required for the Project, primarily under the solar arrays. Following construction, low-growing grasses and forbs would be seeded under the solar arrays (Horse Heaven Wind Farm, LLC 2022). Limited information is provided in the 2022 ASC regarding vegetation maintenance activities during operation. However, it is anticipated that some vegetation maintenance may be required in order to remove shrubs, tall grasses, and tall forbs that may establish under the solar arrays. Maintenance would be limited to trimming and removing plants and may also include removing tumbleweeds from fences. Vegetation maintenance would include maintenance along the solar array fence lines. Additional vegetation maintenance may be required along and adjacent to roads.

Vegetation maintenance would have a direct impact on vegetation resources. The magnitude of the impact is rated negligible. While some vegetation maintenance may be required for general operations, it is anticipated to be limited to areas of permanent disturbance and modified habitat. In addition, planting low-growing grasses and forbs in areas of modified habitat would minimize the amount of vegetation maintenance required. The duration is rated long term as maintenance would be required throughout operations. The likelihood is rated probable, and the spatial extent is rated limited for the substations and BESS and confined for all other Project components, including the comprehensive Project.

Indirect Impacts

Indirect impacts during Project operation would include habitat degradation and habitat fragmentation.

Habitat Degradation

Introduction of Hazardous Substances

Hazardous substances would continue to be stored on site during Project operation. Hazardous substances that would be required for the Project include synthetic lubricating oil, glycol-water mix, transformer mineral oil, hydraulic fluid, and diesel fuel. Impacts of hazardous substances are described in Section 4.5.2.1 and are applicable to Project operations.

Activities during Project operations that could cause the accidental spill or release of hazardous substances include refueling, maintenance of wind turbines, solar arrays, BESS, and substations. Mitigation measures include a Spill Prevention, Control, and Countermeasures Plan and accessible spill kits, which would minimize the impacts of a spill on vegetation resources.

Introduction and Spread of Invasive Plants and Noxious Weeds

Project operation activities would have the potential to cause the introduction and spread of invasive plants and noxious weeds. During operation, maintenance vehicles would be required to access all Project components. Vehicles could carry soil or plant propagules that could introduce or spread invasive plants or noxious weeds.

- During operation, solar panel washing may be required in order to remove dirt, airborne dust, pollution, and other particulates that accumulate on the surface of the panels. This accumulation can reduce sunlight penetration and therefore efficiency of solar electricity production (Sugiartha et al. 2019). Washing solar panels restores panel efficiency. Based on the 2022 ASC, the estimated water use for washing all three Solar Siting Areas would be approximately 2,025,000 gallons per year, if required (Horse Heaven Wind Farm, LLC 2022).[26] The Applicant indicates that the frequency of panel washing is presently unknown and that, if required, panel washing would occur once per year (Horse Heaven Wind Farm, LLC 2022). The Project would be located in an arid environment, where native vegetation is adapted to these conditions. The introduction of additional water through panel washing has the potential to create favorable conditions for the spread of invasive plants and noxious weeds.

The Applicant would monitor construction sites that have been revegetated for a minimum of three years post-construction (Appendix N, Horse Heaven Wind Farm, LLC 2022). Treatment of noxious weeds on site would focus on the areas of temporary and permanent disturbance but would extend to adjacent areas where noxious weeds may have been spread if landowners agree to treatment. BMPs, such as vehicle cleaning, would minimize the introduction and spread of invasive plants and noxious weeds.

Deposition of Dust

As discussed in Section 4.5.2.1, the potential for dust deposition would continue into Project operation. Vehicles accessing the site to perform routine maintenance may generate dust from gravel roads that extends to adjacent vegetation.

[26] The EIS has assessed two of the three Solar Siting Areas and therefore assessed a maximum of 1.35 million gallons of water required annually for washing solar panels during operations.

Habitat Fragmentation

Edge Effects

The landscape within the Lease Boundary would be altered relative to existing conditions during Project operations. Major changes would include the increase in road networks and other linear features, increase in permanent structures, and increased use by humans. While vegetation is not affected by noise and sensory disturbance, effects from increased development can result in “edge effects.”

Edge effects are changes in ecological conditions due to the meeting of two or more different habitat types, which causes the habitats to impact one another. In the case of the Project, edge effects would occur when there is an increase in developed areas that border natural areas. Edge effects can exacerbate other indirect impacts. For example, the Project would increase the number of roads within the Lease Boundary. Road networks and other transportation corridors can alter adjacent vegetation communities. Invasive plants spread through transportation corridors, and in grassland environments, the effects can extend to 150 meters (492 feet) from roads (Hansen and Clevenger 2005). Similarly, dust can extend up to 40 meters (131 feet) from roads (Gleason et al. 2007). Development, in particular linear features, that bisect natural areas result in habitat fragmentation and could continuously degrade adjacent habitat throughout the life of the Project. Mitigation such as noxious weed control and dust control could minimize the impacts.

Access to all Project infrastructure would be needed, so edge effects could impact all Project components. Magnitude is rated medium for the Wind Energy Micrositing Corridor and Solar Siting Areas as edge effects could extend into sensitive receptors. In addition, the newly built roads would cause fragmentation of the central core of some patches of Priority Habitat (e.g., where the Micrositing Corridor divides dwarf shrub-steppe Priority Habitat).

Fire

The impacts of fire are discussed in Section 4.5.2.1. Project operation activities that have the potential to increase the risk of fire include improper vehicle or equipment staging, and improper storage of flammable products, such as diesel for vehicles. In addition, workers on site could accidentally cause a fire in dry conditions—for example, through improper disposal of cigarettes.

Turbine Option 1 and Option 2

Assessment ratings of impacts from Turbine Option 2 are the same as Turbine Option 1.

Direct Impacts

Direct impacts during operation of the turbines include potential loss during vegetation maintenance.

Vegetation Maintenance

The magnitude of the impact for vegetation maintenance is rated negligible. Minor vegetation maintenance may be required along gravel roads or within concrete turbine foundations to maintain permanent access, these areas are considered areas of permanent disturbance. Vegetation maintenance beyond these features would not be anticipated. The duration is rated long term as maintenance would be required throughout operation. The likelihood is rated probable because vegetation is capable of colonizing on gravel roads but may present a hazard that requires removal. The spatial extent is rated confined as vegetation maintenance for turbines would occur in areas associated with permanent disturbance along the Micrositing Corridor.

Indirect Impacts

Indirect impacts during operation of the turbines would include habitat degradation and habitat fragmentation.

Habitat Degradation

The potential exists for habitat degradation to occur during the operation of the turbines. Habitat degradation could occur in the form of the introduction of hazardous substances, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Mitigation measures would be consistent with state and county requirements and spill response equipment would be available on site.

Although noxious weeds and invasive plants are already common on the landscape, existing noxious weeds or noxious weeds introduced during the Construction Stage of the Project, would require several years of treatment and monitoring. While there would be no additional clearing during operations, vehicles and equipment would require site access for routine maintenance, which could present the potential for introduction and spread. The Noxious Weed Prevention and Control Plan (Appendix N, Horse Heaven Wind Farm, LLC 2022) would be implemented during operation. Noxious weeds can spread beyond the initial occurrence and often have traits that facilitate their dispersal and colonization.

Dust sources would be restricted to the vehicles accessing the site for operations. Continual use of roads could cause dust deposition throughout the Project during operation. Dust generated from the Project could be spread beyond the Lease Boundary by wind or water.

The magnitude of habitat degradation is rated as low as sources are likely to be point sources and would not affect sensitive receptors. Habitat degradation is rated as having a long-term duration due to the potential for this impact to occur throughout the Operation Stage. The likelihood is rated as feasible due to nature of the activities, and the spatial extent would be local because the impact would have the potential to occur beyond the Lease Boundary.

Habitat Fragmentation

Habitat fragmentation during the operation of the turbines could include edge effects or increased fire risks.

The newly built roads would cause fragmentation of the central core of some patches of Priority Habitat (e.g., where the Micrositing Corridor divides dwarf shrub-steppe Priority Habitat).

Project operation presents little increased risk of fire from operation activities, however, ecosystem recovery from a fire could take several years. Fire, under the right conditions (e.g., wind and heat), could move across a landscape rapidly and have the potential to impact areas adjacent to the Lease Boundary.

The magnitude of habitat fragmentation is rated as low as some impacts may result but are not anticipated to alter the ecological conditions from present conditions. Habitat fragmentation is rated as having a long-term duration due to the potential for this impact to occur throughout the Operation Stage. The likelihood is rated as feasible, and the spatial extent would be local because the impact would have the potential to occur beyond the Lease Boundary.

Solar Siting Areas

Impacts from the Solar Siting Areas are assessed as direct and indirect impacts. The assessment is not further divided by solar field as the impacts are not anticipated to differ.

Direct Impacts

Direct impacts during operation of the solar arrays include potential loss during vegetation maintenance.

Vegetation Maintenance

Similar to the operation of the turbines, the magnitude of the impact is rated negligible. The duration is rated long term. The likelihood is rated probable, and the spatial extent is rated confined.

Indirect Impacts

Indirect impacts during operation of the solar arrays would include habitat degradation and habitat fragmentation.

Habitat Degradation

Habitat degradation could occur in the form of the introduction of hazardous substances, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Mitigation measures would be consistent with state and county requirements and spill response equipment would be available on site. Identically rated to the operation of turbines, habitat degradation during the operation of Solar Siting Areas is rated low, long-term, feasible, and local.

Habitat Fragmentation

Habitat fragmentation during the operation of Solar Siting Areas could include edge effects and fire. Identically rated to the operation of turbines, habitat fragmentation during the operations of Solar Siting Areas is rated as low, long-term, feasible, and local.

Battery Energy Storage Systems

No differences in impacts are anticipated among the three proposed locations, and the three BESS are rated together in **Table 4.5-12b** (i.e., not broken out as individual BESS).

Direct Impacts

Direct impacts during operation of the BESS include potential loss during vegetation maintenance.

Vegetation Maintenance

Similar to the operation of the turbines, the magnitude of the impact is rated negligible. The duration is rated long term. The likelihood is rated probable, and the spatial extent is rated limited.

Indirect Impacts

Indirect impacts during operation of the BESS would include habitat degradation and habitat fragmentation.

Habitat Degradation

Habitat degradation could occur in the form of the introduction of hazardous substances, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Mitigation measures would be consistent with state and county requirements and spill response equipment would be available on site. Identically rated to the operation of turbines, habitat degradation during the operation of the BESS is rated low, long-term, feasible, and local.

Habitat Fragmentation

Habitat fragmentation during the operation of Solar Siting Areas could include edge effects and fire. The magnitude is rated negligible to low. The BESS are small in size and do not interact with Priority Habitat. The duration is rated long term as the impact could occur throughout operations. The likelihood is rated as feasible. Lithium-ion battery storage may pose a risk of fire due to the tendency for lithium-ion batteries to overheat. The spatial extent is local.

Substations

No differences in impacts are anticipated among the five proposed locations, and the five substations are rated together in **Table 4.5-12b** (i.e., not broken out as individual substations).

Direct Impacts

Direct impacts during operation of the substations include potential loss during vegetation maintenance.

Vegetation Maintenance

Similar to the operation of the turbines, the magnitude of the impact is rated negligible. The duration is rated long term. The likelihood is rated probable, and the spatial extent is rated limited.

Indirect Impacts

Indirect impacts during operation of the substations would include habitat degradation and habitat fragmentation.

Habitat Degradation

Habitat degradation could occur in the form of the introduction of hazardous substances, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Mitigation measures would be consistent with state and county requirements and spill response equipment would be available on site. Identically rated to the operation of turbines, habitat degradation during the operation of substations is rated low, long-term, feasible, and local.

Habitat Fragmentation

Habitat fragmentation during the operation of Solar Siting Areas could include edge effects and fire. Habitat fragmentation is rated low for the substations. The duration is rated long-term. The likelihood is rated unlikely, and spatial extent is local.

Comprehensive Project

Impacts from operations of the comprehensive Project consider all Project components together.

Direct Impacts

Direct impacts during the Project's operation include potential loss during vegetation maintenance.

Vegetation Maintenance

For the comprehensive Project, the magnitude of the impact is rated negligible. The duration is rated long term as maintenance would be required throughout operations. The likelihood is rated probable, and the spatial extent is rated confined.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

Habitat degradation could occur in the form of the introduction of hazardous substances, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Mitigation measures would be consistent with state and county requirements and spill response equipment would be available on site. Identically rated to the operation of turbines, habitat degradation during the operation of the comprehensive Project is rated low, long-term, feasible, and local.

Habitat Fragmentation

Habitat fragmentation during the operation of Solar Siting Areas could include edge effects and fire. The magnitude is rated as low, as the sum of all Project components would result in greater habitat fragmentation. The duration is rated long-term. The likelihood is rated feasible, and the spatial extent is rated local.

4.5.2.3 Impacts during Decommissioning

Impacts associated with decommissioning would be similar to impacts identified for Project construction (Section 4.5.2.1). Indirect impacts associated with Project decommissioning would be the same as during Project construction. Impact descriptions are provided in Section 4.5.2.1, and impact ratings from decommissioning are provided below. A summary of all impact ratings from decommissioning is provided in **Table 4.5-12c**.

Direct Impacts

Loss of Extent of Priority Habitat

Similar to construction, areas of temporary disturbance would be required in order to remove Project components. It is anticipated that the area of disturbance to Priority Habitat required during decommissioning would be similar to that required during construction. However, the areas of permanent disturbance from construction would have remained disturbed from Project construction, and therefore no additional disturbance would be required. Modified habitat associated with the Solar Siting Areas would also be temporarily lost during Project decommissioning. A summary of the areas of temporary disturbance that would be impacted during Project decommissioning, based on existing conditions, is provided in **Table 4.5-10**. Modified habitat is not included in the habitat breakdown as it would not be the same habitat as existing conditions but is assumed to be a mix of low-growing grasses and forbs (no Priority Habitat). A summary of the assessment rating for Project components is provided in **Table 4.5-12c**.

Table 4.5-10: Areas of Temporary Disturbance Required for Project Decommissioning

Habitat Type	Micrositing Corridor Temporary Disturbance (acres)	East Solar Field Temporary Disturbance (acres)	County Well Solar Field Temporary Disturbance (acres)	Sellards Solar Field Temporary Disturbance (acres)
Agriculture Land	2,269	85.6	30.0	85.0
Developed/Disturbed	21	2.7	0.2	0.6
Grassland				
Eastside (Interior) Grassland[(a)]	15	7.9	0	0
Non-native Grassland	136	2.9	0.1	0.2
Planted Grassland	259	19.8	1.3	0.4
Shrubland				
Dwarf Shrub-steppe[(a)]	9	0	0	0
Rabbitbrush Shrubland	141	43.8	0	0
Sagebrush shrub-steppe[(a)]	31	2.5	0	0.3
Total	**2,881**	**165.2**	**31.6**	**86.5**

Source: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b).
Note: It is assumed that the areas of temporary disturbance required for Project construction would also be required for Project decommissioning.

Loss of Extent of Other Habitat

Similar to construction, areas of temporary disturbance would be required in order to remove Project components. It is anticipated that the area of disturbance required during decommissioning would be similar to that required during construction, except for permanent disturbance, which would have remained from Project construction. Modified habitat associated with the Solar Siting Areas would also be temporarily lost during Project decommissioning. Revegetation of the modified habitat may not have returned to the condition of modified habitat, once the solar arrays are removed. The final plan for revegetation following decommissioning has not been prepared, but it is assumed this would be agreed upon with the landowner. A summary of the areas of temporary disturbance that would be impacted during Project decommissioning, based on existing conditions, is provided in **Table 4.5-10**. Modified habitat is assumed to consist entirely of low-growing grasses and forbs. A summary of the assessment rating for Project components is provided in **Table 4.5-12c.**

Loss of Extent of Special Status Plant Species

Areas of temporary disturbance and modified habitat assumed to be impacted during Project decommissioning would have been previously impacted during Project construction. No special status species have been documented within the Lease Boundary; however, there is still potential for special status species to occur. The likelihood of occurrence for special status species would be less during decommissioning than during construction due to the previous disturbance that would have occurred during the Project construction activities. For example, woven spore lichen is known to occur in the Vegetation Area of Analysis. Woven spore lichen grows on soil and decaying bunchgrasses (Stone et al. 2020). Research has found this special status species is less resilient than other curst lichens, has a slower recovery time following disturbance, and, in some cases, may not recover following disturbance (Stone et al. 2020). Despite no direct impact during operations, persistent edge effects from Project infrastructure such as roads throughout the life of the Project would limit the likelihood of special status plants re-establishing. Increased frequency of invasive plants has been found as far as 150 meters (approximately 492 feet) from roads in grasslands relative to control (Hansen and Clevenger 2005). Invasive plants would degrade the habitat and might outcompete or prevent the re-establishment of special status plants. All other assessment criteria would be the same as discussed in Section 4.5.2.1 for each Project component and Project component area.

An assessment of the direct impacts on vegetation resources during Project decommissioning is provided in **Table 4.5-12c**.

Turbine Option 1 and Option 2

Assessment ratings of impacts from Turbine Option 2 are the same as Turbine Option 1.

Direct Impacts

Direct impacts during decommissioning of the turbines include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

Magnitude for loss of extent of Priority Habitat is rated high for temporary disturbance because greater than 20 acres would be temporarily disturbed for decommissioning. The duration is long term because there is uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as unavoidable, and the extent is rated as limited.

Loss of Extent of Other Habitat

Magnitude for loss of other habitats is rated low for temporary disturbance as 3.3 percent of other habitat in the Lease Boundary would be temporarily disturbed for decommissioning. The duration is rated short term. The likelihood is rated as unavoidable, and the spatial extent would be confined.

Loss of Extent of Special Status Plant Species

Magnitude for loss of extent of special status plant species is rated low. The duration of loss of extent of special status plant species is rated constant. The likelihood is rated as unlikely, and the spatial extent is local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The potential exists for habitat degradation to occur during the decommissioning of the turbines. Commitments proposed by the Applicant would meet state and county requirements for best practices, but habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust.

Accidental spills related to the decommissioning of the Project would be small in scale and would originate from a point source of either equipment or vehicles. The development of a Spill Response Plan would minimize the risk of spills and spill response material would be available on site.

Surface runoff is not anticipated to exceed greater than 100 acres. Vegetation resources are expected to recover following removal of the source of surface runoff. The development of the SWPPP and TESC Plan would minimize the risk of surface runoff.

Noxious weeds and invasive plants are already common in the Micrositing Corridor, which would provide a continuous source for weeds to establish. Noxious weeds and invasive plants typically require multiple years of treatment and monitoring to control. There is a high likelihood that equipment would encounter invasive plants on site during the decommissioning of the turbines. This could result in spreading invasive plants to work areas through soil or plant propagules, even with best practices and mitigation. Implementation of a Noxious Weed Control Plan during decommissioning would reduce the potential for impacts. Invasive plants and noxious weeds could spread beyond the initial occurrence, including the Lease Boundary, and often have traits that facilitate their dispersal and colonization.

There would be a small increase in dust-generating activities that could impact adjacent vegetation during the decommissioning of the turbines. The arid environment increases the potential for dust-generating activities. Dust generated from the Project could be spread beyond the Lease Boundary by wind or water.

The magnitude of habitat degradation during the decommissioning of the turbines is rated as low as sources are likely to be point sources and would not affect sensitive receptors. Habitat degradation is rated as having a long-term duration due to the potential for this impact to occur throughout the Decommissioning Stage and beyond the life of the Project. The likelihood is rated as feasible due to the nature of the activities, and the spatial extent would be local because the impact would have the potential to occur beyond the Lease Boundary.

Habitat Fragmentation

Project decommissioning of the turbines has the potential to result in habitat fragmentation in the form of fire risk. The magnitude of the impact on vegetation resources is rated low because most Project activities would not have a high risk of causing fire and vegetation could recover following a fire. The duration is rated long term as ecosystem recovery from a fire could take several years. The likelihood is rated as feasible with the application of BMPs. During decommissioning, turbine towers would require disassembly, which could require hot works. The spatial extent is local as fire, under the right conditions (e.g., wind and heat), could move across a landscape rapidly and have the potential to impact areas adjacent to the Lease Boundary.

Solar Siting Areas

Direct Impacts

Direct impacts during decommissioning of the solar arrays include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

East Solar Field: Impacts from temporary disturbance on Priority Habitat are rated medium in magnitude because approximately 10.4 acres of Priority Habitat could be temporarily disturbed during decommissioning. The duration is rated long term because of the uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as unavoidable, and the spatial extent is rated limited.

County Well Solar Field: Loss of Priority Habitat from temporary disturbance for the County Well Solar Field is rated negligible for magnitude because no Priority Habitat would be disturbed. The duration is long term. While revegetation would occur following decommissioning, it is likely it will take time for Priority Habitat ecosystems to re-establish following disturbance. The likelihood is rated as unlikely because no Priority Habitat is known to occur in temporary disturbance areas, and the spatial extent is rated as limited.

Sellards Solar Field: Loss of Priority Habitat for Sellards Solar Field is rated low magnitude for temporary disturbance because there are 0.3 acres of Sagebrush Shrub-steppe Priority Habitat within temporary disturbance areas. The duration is long term because of the uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as feasible for temporary disturbance dependent on potential micrositing that may have occurred during construction to minimize or avoid. The spatial extent is rated as limited.

Loss of Extent of Other Habitat (All Solar Siting Areas)

Impacts of temporary disturbance on other habitat for all Solar Siting Areas are rated negligible in magnitude. The duration is rated short term. The likelihood is rated as unavoidable, and the spatial extent is rated as limited.

Loss of Extent of Special Status Plant Species

East Solar Field: Magnitude is rated low for loss of extent of special status plant species. No special status plant species have been observed during field surveys and areas of temporary disturbance would have been disturbed during construction reducing the likelihood of special status plant species occurring. However, Priority Habitat would be temporarily disturbed. The duration is rated constant. The likelihood is rated as unlikely, and the spatial extent is rated local.

County Well Solar Field: The magnitude of impact is rated negligible. No special status plant species have been observed during field surveys, and no Priority Habitat occurs within temporary disturbance areas. The duration of loss of extent of special status plant species is rated constant. The likelihood is rated as unlikely, and the spatial extent is rated local.

Sellards Solar Field: Magnitude is rated low for loss of extent of special status plant species. No special status plant species have been observed during field surveys and areas of temporary disturbance would have been disturbed during construction reducing the likelihood of special status plant species occurring. However, the habitat mapping indicates 0.3 acres of sagebrush shrub-steppe would be impacted during construction, which is assumed to be required during decommissioning. The duration of loss of extent of special status plant species is rated constant. The likelihood is rated as unlikely, and the spatial extent is rated local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation (All Solar Siting Areas)

The potential exists for habitat degradation to occur during the decommissioning of the solar arrays. Commitments proposed by the Applicant would meet state and county requirements for best practices, but habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Impact ratings are identical to decommissioning of the turbines and is rated low, long term, feasible, and local.

Habitat Fragmentation (All Solar Siting Areas)

Project decommissioning of the solar arrays has the potential to result in habitat fragmentation in the form of fire risk. The magnitude of impacts on vegetation resources is rated low. The duration is rated long term. The likelihood is rated as unlikely. Decommissioning of the solar arrays is not likely to require hot works. The spatial extent is local.

Battery Energy Storage Systems

No differences in impacts are anticipated among the three proposed locations, and the three BESS are rated together in **Table 4.5-12c** (i.e., not broken out as individual BESS).

Direct Impacts

Direct impacts during decommissioning of the BESS include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

The assessment of loss of Priority Habitat for the BESS is rated negligible for temporary disturbance. The duration is short term. The likelihood is rated as unlikely, and the spatial extent is rated as limited.

Loss of Extent of Other Habitat

Loss of other habitats is rated negligible in magnitude for temporary disturbance. The duration is rated short term. The likelihood is rated as unavoidable, and the spatial extent is rated as limited.

Loss of Extent of Special Status Plant Species

The magnitude of impact is rated negligible. The duration of loss of extent of special status plant species is rated constant. The likelihood is rated as unlikely, and the spatial extent is rated local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The potential exists for habitat degradation to occur during the decommissioning of the BESS. Commitments proposed by the Applicant would meet state and county requirements for best practices, but habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Impact ratings are identical to decommissioning of the turbines, and the impacts from decommissioning of the BESS are rated low, long term, feasible, and local.

Habitat Fragmentation

Project decommissioning of the BESS has the potential to result in habitat fragmentation in the form of fire risk. The impact ratings are identical to the decommissioning of the solar arrays. Impacts are rated low, long term, unlikely, and local.

Substations

No differences in impacts are anticipated among the five proposed locations, and the five substations are rated together in **Table 4.5-12c** (i.e., not broken out as individual substations).

Direct Impacts

Direct impacts during decommissioning of the substations include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent of Priority Habitat

Magnitude of impact related to loss of Priority Habitat for the substations and substations is rated negligible for temporary disturbance. The duration is short term. The likelihood is rated as unlikely, and the spatial extent is rated as limited.

Loss of Extent of Other Habitat

Magnitude of impact related to loss of other habitats is rated negligible for temporary disturbance. The duration is rated short term. The likelihood is rated as unavoidable, and the spatial extent is rated as limited.

Loss of Extent of Special Status Plant Species

Magnitude of impact is rated negligible. The duration of loss of extent of special status plant species is rated constant. The likelihood is rated as unlikely, and the spatial extent is rated local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The potential exists for habitat degradation to occur during the decommissioning of the substations. Commitments proposed by the Applicant would meet state and county requirements for best practices, but habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Impact ratings are identical to decommissioning of the turbines and the impacts from decommissioning of the substations are rated low, long term, feasible, and local.

Habitat Fragmentation

Decommissioning of the substations has the potential to result in habitat fragmentation in the form of fire risk. The impact ratings are identical to the decommissioning of the solar arrays. Impacts are rated low, long term, unlikely, and local.

Comprehensive Project

Impacts from decommissioning of the comprehensive Project consider all Project components together.

Direct Impacts

Direct impacts during decommissioning of the Project include the loss of extent of Priority Habitat, other habitat, and special status species.

Loss of Extent Priority Habitat

The assessment of impacts is the same as Turbine Option 1. Loss of Priority Habitat is rated high in magnitude for temporary disturbance. The duration is long term because of the uncertainty associated with revegetation success and the time lag associated with achieving mature shrub-steppe. The likelihood is rated as unavoidable, and the extent is rated as limited.

Loss of Extent of Other Habitat

The assessment of impacts is the same as Turbine Option 1. Loss of other habitats is rated low in magnitude for temporary disturbance. The duration is rated short term. The likelihood is rated as unavoidable, and the spatial extent is rated as confined.

Loss of Extent of Special Status Plant Species

The assessment of impacts is the same as Turbine Option 1. Loss of extent of special status plant species is rated low in magnitude. The duration of loss of extent of special status plant species is rated constant. The likelihood is rated as unlikely, and the spatial extent is rated as local.

Indirect Impacts

Indirect impacts are classified into two categories: habitat degradation and habitat fragmentation.

Habitat Degradation

The potential exists for habitat degradation to occur during the decommissioning of all Project components. Commitments proposed by the Applicant would meet state and county requirements for best practices, but habitat degradation could occur in the form of the introduction of hazardous substances, the potential for surface runoff, the introduction or spread of invasive plants and noxious weeds, and the deposition of dust. Impact ratings are identical to decommissioning of the turbines and the impacts from decommissioning of all Project components are rated low, long term, feasible, and local.

Habitat Fragmentation

Project decommissioning of all Project components has the potential for habitat fragmentation in the form of fire risk. Impact ratings are identical to decommissioning of the turbines because the turbines present the greatest likelihood for an impact from fire. Impact ratings for all Project components are low, long term, feasible, and local.

4.5.2.4 Recommended Mitigation Measures

This section describes measures that would reduce or compensate for impacts related to vegetation from construction, operation, and decommissioning of the Project. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action. For vegetation resources, measures should be applied following a hierarchy of most effective to least effective: avoid, minimize, restore, compensate. Avoidance of impacts is the best mitigation. A definition of each type of measure as related to vegetation resources that would be impacted by the Project is provided below.

- **Avoid:** refers to altering aspects of the Project such as location, scale, timing, or layout to avoid impacts on vegetation resources
- **Minimize:** refers to considering alternatives to location, size, or layout to create a smaller impact on vegetation resources
- **Restore:** refers to rectifying the impact by repairing, rehabilitating, or reestablishing the affected environment such as revegetating temporary disturbance areas
- **Offset/Compensate:** refers to conducting measures to rehabilitate areas not impacted by the Project to compensate for impacts on vegetation resources
- **Contingency:** refers to monitoring impacts from the Project and taking appropriate corrective actions, when it is not possible to predict with certainty the impact
- EFSEC has identified the following mitigation measures for the Project to avoid and/or minimize impacts on vegetation:

Veg-1:[27] **Tree Avoidance:** Construction would avoid removing or disturbing trees within the Project Lease Boundary. Disturbance to trees includes any disturbance within the drip-line of the tree (i.e., the area from the edge of the outermost branches), including topping, which preserves an intact root system. Disturbance within the drip-line of the tree should be avoided as this can lead to tree mortality. The avoidance area within the drip-line of trees in work areas should be delineated using snow fencing or similar measure to improve the visibility of avoidance zones. Trees cannot be removed without pre-approval. Where tree disturbance cannot be avoided by the Project (e.g., near transmission lines), the number and location of the trees would be provided to EFSEC, along with a statement justifying why avoidance cannot be achieved, and a mitigation plan. The mitigation plan would include replanting trees within the Lease Boundary to maintain the diversity of habitat structures provided by trees and would require approval by EFSEC prior to proceeding.

Rationale: Trees are a rare feature on the landscape that provide habitat value to wildlife species and structural diversity. Replanting trees may be challenging in an arid environment, and there would be a time lag before trees reach the same size and age. Veg-1 seeks to avoid physical disturbance to existing trees.

Veg-2: Pre-Disturbance Surveys for Special Status Plant Species: Special status plant species are known to occur near the Lease Boundary. Areas with increased potential for special status plant species include areas of Priority Habitat and areas identified by the Applicant as potential habitat for woven spore lichen. Where possible, disturbance to Priority Habitat and high potential areas will be avoided, but if avoidance is not possible surveys for special status plant surveys will be conducted. Surveys would be conducted by a qualified professional. Surveys would be conducted prior to both construction and decommissioning activities. All findings would be documented and provided to EFSEC in an annual report. Where special status plant species are encountered within proposed disturbance areas, the Applicant will modify the Project

[27] Veg-: Identifier of numbered mitigation item for Vegetation

design to avoid the species or, where modification is not possible, develop additional mitigation measures based on discussions with EFSEC and WDFW, such as relocation where a species is tolerant of relocation; minimization; or other form of mitigation. Mitigation plans for encountered special status plant species will be provided to EFSEC for consideration and to provide additional direction. Any modifications to Project design would also be provided to EFSEC as part of the report. An environmental monitor would be required to track any mitigation associated with the finding of special status plant species.

Rationale: This mitigation measure minimizes potential impacts on special status plant species by providing an opportunity to modify the design to avoid any identified plants, prior to actual disturbance activities during construction and decommissioning. It also provides the opportunity to apply additional mitigation should special status plant species be encountered within disturbance areas.

Veg-3: Special Status Plant Species Education: The environmental orientation provided to workers on site would include information on special status plant species. This would include diagnostic characteristics, suitable habitat descriptions, and photos of special status plant species with potential to occur within the Lease Boundary. A protocol would be established for any chance find by workers, who would notify the environmental monitor on site prior to proceeding with work. The environmental monitoring would report any findings of special status plant species to EFSEC in a report, and EFSEC would consider these reports and provide additional direction on actions to address any impacts. Workers' completion of the environmental orientation would be tracked by the Applicant and provided in an annual report to EFSEC.

Rationale: This mitigation measure minimizes impacts on special status plant species by educating workers in identification and suitable habitat.

Veg-4: As-Built Report, Offset Calculation, and Monitoring of Revegetation: Within 60 days of completing construction, the Applicant would provide an as-built report that documents the amount of temporary and permanent disturbance associated with the Project. This would include associated maps and georeferenced spatial files. The as-built report would be factored into the final calculation of habitat offset based on the Applicant-provided ratios. The acreages of modified habitat planted for the Project under the solar arrays would also be included in this report. EFSEC would determine the number of years that vegetation monitoring of temporary disturbance and modified habitat would be conducted and the success criteria for revegetation. The success criteria would include measurable parameters that the Applicant would measure to determine whether successful revegetation has occurred. The Applicant would submit annual reports for each year of vegetation monitoring following construction to document the success of revegetation. At the end of the vegetation monitoring period, as determined by EFSEC, areas of modified habitat and revegetated temporary disturbance that have met the success criteria would be eligible for offset by the Applicant at the respective ratios. Any areas of modified habitat or temporary disturbance that do not meet the success criteria after completion of revegetation monitoring would be considered permanent disturbance, and this would be added to the offset requirement.

Rationale: This mitigation measure addresses habitat offset by providing a final calculation of offset requirements based on actual disturbance. In addition, it addresses the uncertainty associated with the success of revegetation and, in particular, of restoring shrub-steppe ecosystems.

Veg-5: Operation and Decommissioning Dust Control Plan: A dust control plan would be prepared for Project operation and decommissioning, similar to the dust control plan presented by the Applicant. The plan would minimize impacts on vegetation from dust during the Operation and Decommissioning stages of the Project.

Rationale: This mitigation measure minimizes indirect impacts from dust during operation and decommissioning.

Veg-6: Decommissioning Legislated Requirements: Mitigation measures that would be applied during decommissioning would follow the applicable legislated requirements at the time of decommissioning.

Rationale: This mitigation measure enables adjustment of requirements based on changes in legislation once decommissioning occurs, based on the requirements at that time.

Veg-7: Detailed Site Restoration Plan: The Detailed Site Restoration Plan is a required, regulatory document. It would be prepared and submitted for approval by EFSEC for final revegetation prior to Project decommissioning for the temporary and permanent disturbance areas. It would be adapted to include modified habitat.

Rationale: The Detailed Site Restoration Plan would be a living document. It would include the methods, success criteria, monitoring, and reporting for revegetation at the end of the Project life. It would also include provisions for adaptive management and would be prepared based on any lessons learned from implementing the revegetation planned for the temporary disturbance from Project construction as described in Appendix N of the 2022 ASC (Appendix N, Horse Heave Wind Farm, LLC 2022)..

Veg-8: Decommissioning Noxious Weed Management Plan: A Noxious Weed Management Plan (or extension of the current plan) to include prevention and control during decommissioning of the Project would be prepared. This Plan would include monitoring of the area for three years following decommissioning of the Project.

Rationale: This mitigation measure addresses noxious weeds during decommissioning. It is designed to minimize the introduction and spread of noxious weeds during decommissioning.

Veg-9: Maintenance of Solar Array Fence: During Project operation, the solar array fence would be maintained, including removal of vegetation material that may become entwined in the fence.

Rationale: Vegetation material entwined within the solar array fence presents a fuel source for fire. Maintenance and removal would minimize this risk.

Additional mitigation measures identified in the Wildlife and Wildlife Habitat Section (Chapter 4.6) are also applicable to vegetation and are provided below.

Hab-2: Transmission line crossings of canyons and draws would be minimized. Where crossings are required, the Applicant would provide EFSEC with rationale for the crossings and propose additional mitigation measures to reduce potential barriers to movement (e.g., retaining vegetation under transmission lines) and wildlife collisions (e.g., installing flight diverters on overhead lines). EFSEC would approve the final transmission line layout, mitigation, and adaptive management strategy.

Rationale: This mitigation measure reduces potential Project-related barriers to wildlife movement while allowing for continued monitoring and adaptive management of potential Project-related barriers.

Hab-3: Temporary laydown areas. Temporary laydown areas would be situated out of native shrub-steppe habitat. Where temporary disturbance of shrub-steppe habitat is required, the Applicant would provide EFSEC with rationale and propose additional mitigation measures to reduce habitat loss.

Rationale: This mitigation measure avoids and reduces impacts on habitat while allowing for adaptive management of potential Project-related habitat loss.

Hab-4: The Applicant, in consultation with EFSEC, would establish a Pre-operational Technical Advisory Group (PTAG) and Technical Advisory Committee (TAC). The PTAG would be established at least one year prior to construction and would be responsible for reviewing and providing technical advice on documents produced by the Applicant related to wildlife and wildlife habitat. The PTAG would also provide advice on adaptive management. The PTAG would be responsible for, at a minimum:

- Reviewing and providing technical advice on Project wildlife and habitat management plans (e.g., ferruginous hawk management plan)
- Reviewing and providing advice to EFSEC on pre-design and pre-construction data collection requirements to address Project mitigation measures and conditions of management plans
- Reviewing and providing advice to EFSEC on the final Project design
- Advising on thresholds to be applied to the Project that would trigger the requirement for additional mitigation measures

The Applicant, in consultation with EFSEC, would establish a TAC prior to Project operation. The PTAG would cease to exist once the Applicant has completed all planned construction and would be replaced by the TAC, which would exist for the life of the Project. The TAC would be responsible for, at a minimum:

- Advising on the monitoring of mitigation effectiveness and reviewing monitoring reports
- Advising on additional or new mitigation measures that would be implemented by the Applicant to address exceedances of thresholds
- Reviewing the results of annual data generated from surveys and incidental observations and providing recommendations for alternative mitigation and adaptive management strategies, as well as advising on aspects of existing mitigation that are no longer needed.

The PTAG and TAC may include representation by WDFW, the Washington Department of Natural Resources, interested tribes, Benton County, and the USFWS. The PTAG and TAC may also include local interest groups, not-for-profit groups, and landowners. The exact composition of the PTAG and TAC would be determined through discussions between the Applicant and EFSEC and would depend on the relevance and/or availability of proposed members.

Rationale: This mitigation measure avoids and reduces impacts on wildlife and habitat, including habitat loss, wildlife disturbance, barriers to movement, and wildlife mortality. Further the mitigation measure will allow for continued monitoring and adaptive management of potential Project-related impacts.

Hab-6: Final Design: The Applicant would work with EFSEC, with advice from the PTAG, on the development of the final Project layout and design, including the application of Applicant commitments and recommended mitigation measures.

Rationale: This mitigation measure avoids and reduces potential habitat loss and disturbance to wildlife (indirect habitat loss).

Hab-7: All roadways constructed for the Project during the construction and operation phases would be removed and restored during decommissioning. The Applicant would provide EFSEC with rationale and propose additional mitigation measures if roadways are not decommissioned post-operation.

Rationale: This mitigation measure restores habitat post-operation and reduces habitat loss.

Hab-8: The Applicant would be required to provide compensation habitat loss and alteration (indirect habitat loss) (See Hab-5, Veg-4) through one or more actions of land acquisition, onsite easement and restoration (excluding areas impacted by the Project such as temporary laydowns), and/or fee-based mitigation.

The Applicant would prioritize development of conservation easements (Option 1[28] in the Applicant's Draft Wildlife and Habitat Mitigation Plan) and would compensate for the remaining permanent and altered (indirect) impacts by providing money to WDFW, or a third party identified by WDFW, and agreed to by EFSEC, to purchase other lands suitable as in-kind and/or enhancement mitigation. The Applicant would provide EFSEC, for review and approval, with rationale for fee-based mitigation (Options 2 and 3 in the Applicant's Draft Wildlife and Habitat Mitigation Plan) including a description of how much compensatory habitat would be addressed through Option 1 (conservation easement) and rationale for why fee-based mitigation is required.

The fee-based mitigation includes a per acre fee that would be determined by market rates and land sales within the general vicinity of the Lease Boundary for lands containing comparable habitat types and quality present within the Lease Boundary. The per acre fee would be developed by the Applicant in consultation with WDFW and approved by EFSEC. The Total Financial Obligation (TFO) would be determined by multiplying the cost per acre by the total Compensatory Mitigation Acres (CMA) remaining after the application of Option 1 mitigation strategy and would include a one-time 15 percent premium to cover administration and management costs for the purchased lands. The TFO for compensatory mitigation would be determined and agreed to by EFSEC 90 days before construction. If construction has not begun within 12 months of the approval of the TFO, the TFO identified would expire and be recalculated prior to beginning construction. The TFO would be calculated based on the following:

Average Comparable Land Sale Cost (per acre)*(CMA-Option 1 Acres)*1.15 = TFO

In addition to the wildlife and habitat mitigation measures, the following measures developed for the Vegetation chapter are applicable to wildlife and habitat.

Rationale: This mitigation measure clarifies the process to be followed in selection of offsetting habitat.

4.5.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-

[28] Applicant's Draft Wildlife and Habitat Mitigation Plan identifies three compensation options: Option 1 – Conservation easement within or adjacent to the Lease Boundary; Option 2 – Annual fee or lump sum payment provided to WDFW; Option 3 – payment to local land trusts, conservation organizations, or local tribes to support conservation projects.

recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project made in response to comments received on the EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the BPA. Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[29]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

[29] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

A summary of habitat types that occur within the updated East Solar Array fence is provided in **Table 4.5-11**. An updated disturbance layer was not provided as part of the 2022 ASC, but because these areas are all within the updated fence the impacts are considered permanent discussed in Section 4.5.2.1. **Table 4.5-11** also includes the summary of the areas within the original East Solar Array fence for comparison, also considered permanent impacts. While the overall size of the solar arrays in the East Solar Siting Area has reduced, impacts to Priority Habitat remain similar to the original solar array design. Reductions are primarily within rabbitbrush shrubland, agriculture land, and planted grassland.

Table 4.5-11: Comparison of Habitat Types and Subtypes in the Updated and Original East Solar Array Fence

Habitat Type	Updated East Solar Array Fence	Original East Solar Array Fence
Agriculture Land	495.4	1,052.9
Developed/Disturbed	-	-
Grassland		
Eastside (Interior) Grassland[a]	67.0	72.5
Non-native Grassland	1.57	21.6
Planted Grassland	-	140.3
Shrubland		
Dwarf Shrub-steppe[a]	-	-
Rabbitbrush Shrubland	74.1	706.1
Sagebrush Shrub-steppe[a]	0.9	0.3
Total	**639.0**	**1993.9**

Source: Horse Heaven Wind Farm, LLC 2021b; Horse Heaven Wind Farm, LLC 2023
Notes: Calculations of areas were completed independently using spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b; Horse Heaven Wind Farm, LLC 2023).
(a) Washington State Department of Fish and Wildlife Priority Habitats

Similarly, the Final ASC includes modifications to the turbine layout including the removal of 13 turbines and the adjustment of location for three turbines from Turbine Option 1 and the removal of three turbines from Turbine Option 2. The removal of the turbines for Turbine Option 1 reduces impacts to agricultural land, non-native grassland, and planted grassland. The removal of the turbines for Turbine Option 2 reduces impacts to agricultural land only. No Priority Habitat is located in the area where the turbines were removed. The turbines that were adjusted in location for Turbine Option 1 all occur in agriculture land and were moved to areas classified as agriculture land. No Priority Habitat is located within the proposed or previously proposed areas of the adjusted turbines.

The Applicant provided additional commitments as part of the Final ASC. Those applicable to vegetation resources are provided below (Horse Heaven Wind Farm, LLC 2023).

- The Project was sited outside of wetlands and waters to the extent feasible to avoid and minimize impacts to these resources, which will also avoid impacts to fish and minimize impacts to wildlife species that use these habitats.
- Following construction, temporarily disturbed areas will be revegetated with native or non-invasive, non-persistent non-native plant species as described in the Revegetation and Noxious Weed Management Plan (Appendix N, Horse Heaven Wind Farm, LLC 2022).

- Prior to construction, habitat surveys will be conducted within the Solar Siting Areas and portions of the Micrositing Corridor that were not surveyed in 2020 or 2021. These habitat surveys will focus on documenting areas of sagebrush shrub-steppe habitat. Sagebrush shrub-steppe habitat would be avoided to the extent possible. If avoidance is not possible, mitigation for impacts to sagebrush shrub-steppe habitat would be developed in consultation with the applicable agencies.
- Prior to construction, special status plant surveys will be conducted within the Solar Siting Areas and portions of the Project Micrositing Corridor that were not surveyed in 2020 or 2021.
- The Turbine layouts presented in this Final ASC include a reduction in the total number of Turbines (reduced from the previous maximum of 244 Turbines to the current maximum of 231 Turbines for Option 1; and reduced from the previous 150 Turbines to the current maximum of 147 Turbines for Option 2). In addition, solar panels in proximity to I-82 have been removed, such that all panels will be approximately 1 mile east of I-82. These layout modifications result in a reduction in impacts to habitat and wildlife.

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for vegetation in the Draft EIS, and the impact ratings remain the same.

4.5.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (Washington Administrative Code 197-11-794).

This EIS weighs the impacts on vegetation that may result from the Project with mitigation and makes a resulting determination of significance for each impact in **Tables 4.5-12a, 4.5-12b, and 4.5-12c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to vegetation resources.

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Table 4.5-12a: Summary of Potential Impacts on Vegetation during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Loss of Extent of Priority Habitat – Temporary Disturbance	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	High	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Priority Habitat – Temporary Disturbance	East Solar Field	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Medium	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Priority Habitat – Temporary Disturbance	Sellards Solar Field	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Low	Long Term	Feasible	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report and Offset Calculation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified

Table 4.5-12a: Summary of Potential Impacts on Vegetation during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Loss of Extent of Priority Habitat – Temporary Disturbance	County Well Solar Field BESS Substations	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Negligible	Long Term	Unlikely	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Priority Habitat - Permanent Disturbance	Turbine Option 1 Turbine Option 2	Site clearing associated with permanent disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Low	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Priority Habitat - Permanent Disturbance	East Solar Field **Comprehensive Project**	Site clearing associated with permanent disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	High	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified

Table 4.5-12a: Summary of Potential Impacts on Vegetation during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Loss of Extent of Priority Habitat – Permanent Disturbance	County Well Solar Field Sellards Solar Field BESS Substations	Site clearing associated with permanent disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Negligible	Long Term	Unlikely	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent Other Habitat – Temporary Disturbance	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with other habitat.	Low	Short Term	Unavoidable	Confined	**Veg-1:** Tree Avoidance **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation	None identified
Loss of Extent Other Habitat – Temporary Disturbance	Solar Arrays BESS Substations	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with other habitat.	Negligible	Short Term	Unavoidable	Limited	**Veg-1**: Tree Avoidance **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation	None identified
Loss of Extent of Other Habitat – Permanent Disturbance	East Solar Field **Comprehensive Project**	Site clearing associated with permanent disturbance would result in direct loss of acreage associated with other habitat.	Low	Long Term	Unavoidable	Confined	**Veg-1:** Tree Avoidance **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation	None identified
Loss of Extent of Other Habitat – Permanent Disturbance	Turbine Option 1 Turbine Option 2 County Well Solar Field Sellards Solar Field BESS Substations	Site clearing associated with permanent disturbance would result in direct loss of acreage associated with other habitat.	Negligible	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation	None identified

Table 4.5-12a: Summary of Potential Impacts on Vegetation during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Loss of Extent of Special Status Plant Species	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Site clearing associated with the construction of the Project would result in direct loss of populations of special status plant species or their habitat.	Medium	Constant	Feasible	Local	**Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-3:** Special Status Plant Species Education **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Special Status Plant Species	East Solar Field	Site clearing associated with the construction of the Project would result in direct loss of populations of special status plant species or their habitat	Medium	Constant	Unlikely	Local	**Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-3:** Special Status Plant Species Education **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Special Status Plant Species	Sellards Solar Field	Site clearing associated with construction of the Project would result in direct loss of populations of special status plant species or their habitat.	Low	Constant	Unlikely	Local	**Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-3:** Special Status Plant Species Education **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified

Table 4.5-12a: Summary of Potential Impacts on Vegetation during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Loss of Extent of Special Status Plant Species	County Well Solar Field BESS Substations	Site clearing associated with construction of the Project would result in direct loss of populations of special status plant species or their habitat.	Negligible	Constant	Unlikely	Local	**Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-3:** Special Status Plant Species Education **Veg-4:** As-Built Report, Offset Calculation, and Monitoring of Revegetation **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Habitat Degradation	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction activities could result in habitat degradation from introduction of hazardous material, surface runoff, introduction and spread of invasive plants or noxious weeds, and deposition of dust.	Low	Long Term	Feasible	Local	**Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design	None identified
Habitat Fragmentation	Turbine Option 1 Turbine Option 2 BESS **Comprehensive Project**	Construction activities could result in habitat fragmentation from fire.	Low	Long Term	Feasible	Local	**Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design	None identified
Habitat Fragmentation	Solar Arrays BESS Substations	Construction activities could result in habitat fragmentation from fire.	Low	Long Term	Unlikely	Local	**Hab-2:** Transmission Line **Hab-3:** Temporary laydown areas **Hab-4:** Pre-operational Technical Advisory Group **Hab-6:** Final Design	None identified

Notes:
(a) The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; WDFW = Washington Department of Fish and Wildlife

Table 4.5-12b: Summary of Potential Impacts on Vegetation during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Vegetation Maintenance	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	During Project operation, vegetation may require maintenance, such as cutting or removal, for areas under the solar arrays, or along roadways.	Negligible	Long Term	Probable	Confined	No mitigation identified	None identified
Vegetation Maintenance	BESS Substations	During Project operation, vegetation may require maintenance, such as cutting or removal, for areas under the solar arrays, or along roadways.	Negligible	Long Term	Probable	Limited	No mitigation Identified	None identified
Habitat Degradation	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Project operations could result in habitat degradation from the introduction of hazardous substances, introduction and spread of noxious weeds and invasive plants, and deposition of dust.	Low	Long Term	Feasible	Local	**Veg-5:** Operation and Decommissioning Dust Control Plan **Hab-4:** Pre-operational Technical Advisory Group	None identified
Habitat Fragmentation	Turbine Option 1 Turbine Option 2	Project operations could result in habitat fragmentation from edge effects and fire.	Low	Long Term	Feasible	Local	**Veg-5:** Operation and Decommissioning Dust Control Plan **Hab-4:** Pre-operational Technical Advisory Group	None identified
Habitat Fragmentation	Solar Arrays BESS **Comprehensive Project**	Project operations could result in habitat fragmentation from edge effects and fire.	Low	Long Term	Feasible	Local	**Veg-5:** Operation and Decommissioning Dust Control Plan **Veg-9:** Maintenance of Solar Array Fence **Hab-4:** Pre-operational Technical Advisory Group	None identified
Habitat Fragmentation	Substations	Project operations could result in habitat fragmentation from edge effects and fire.	Low	Long Term	Unlikely	Local	**Veg-5:** Operation and Decommissioning Dust Control Plan **Veg-9:** Maintenance of Solar Array Fence **Hab-4:** Pre-operational Technical Advisory Group	None identified

Notes:
(a) The impacts related to each component including “comprehensive Project” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.

BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; WDFW = Washington Department of Fish and Wildlife

Table 4.5-12c: Summary of Potential Impacts on Vegetation during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Loss of Extent of Priority Habitat – Temporary Disturbance	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Decommissioning of the Project would require temporary disturbance areas to remove Project components, which would result in direct loss of WDFW Priority Habitat.	High	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Priority Habitat – Temporary Disturbance	East Solar Field	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Medium	Long Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent of Priority Habitat – Temporary Disturbance	County Well Solar Field BESS Substations	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Negligible	Short Term	Unlikely	Limited	**Veg-1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified

Table 4.5-12c: Summary of Potential Impacts on Vegetation during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Loss of Extent of Priority Habitat – Temporary Disturbance	Sellards Solar Field	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with WDFW Priority Habitat.	Low	Long Term	Feasible	Limited	**Veg1:** Tree Avoidance **Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Loss of Extent Other Habitat – Temporary Disturbance	Turbine Option 1 Turbine Option 2 **Project** **Comprehensive Project**	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with other habitat.	Low	Short Term	Unavoidable	Confined	**Veg-1:** Tree Avoidance **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan	None identified
Loss of Extent Other Habitat – Temporary Disturbance	Solar Arrays BESS Substations	Site clearing associated with temporary disturbance would result in direct loss of acreage associated with other habitat.	Negligible	Short Term	Unavoidable	Limited	**Veg-1:** Tree Avoidance **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan	None identified
Loss of Extent Special Status Plant Species	Turbine Option 1 Turbine Option 2 East Solar Field **Comprehensive Project**	Site clearing associated with decommissioning of the Project would result in direct loss of populations of special status plant species or their habitat.	Low	Constant	Unlikely	Local	**Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified

Table 4.5-12c: Summary of Potential Impacts on Vegetation during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Loss of Extent Special Status Plant Species	County Well Solar Field Sellards Solar Field BESS Substations	Site clearing associated with decommissioning of the Project would result in direct loss of populations of special status plant species or their habitat.	Negligible	Constant	Unlikely	Local	**Veg-2:** Pre-Disturbance Surveys for Special Status Plant Species **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Habitat Degradation	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Project decommissioning could result in habitat degradation from the introduction of hazardous material, surface runoff, introduction or spread of invasive plant or noxious weeds, and the deposition of dust.	Low	Long Term	Feasible	Local	**Veg-5:** Operation and Decommissioning Dust Control Plan **Veg-6:** Decommissioning Legislated Requirements **Veg-7:** Detailed Site Restoration Plan **Veg-8:** Decommissioning Noxious Weed Management Plan **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Habitat Fragmentation	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Project decommissioning could result in habitat fragmentation from fire.	Low	Long Term	Feasible	Local	**Veg-6:** Decommissioning Legislated Requirements **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified
Habitat Fragmentation	Solar Arrays BESS Substations	Project decommissioning could result in habitat fragmentation from fire.	Low	Long Term	Unlikely	Local	**Veg-6:** Decommissioning Legislated Requirements **Hab-7:** Road Decommissioning **Hab-8:** Compensation Habitat Loss and Alteration	None identified

Notes:
[a] The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[d] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; WDFW = Washington Department of Fish and Wildlife

4.5.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to vegetation from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.6 Wildlife and Habitat

This section describes the potential impacts on wildlife and habitat resources, identified in Section 3.6, that could result from the construction, operation, and decommissioning of the Horse Heaven Wind Farm (Project, or Proposed Action) or under the No Action Alternative.

The evaluation presented here relies on the impact scale defined in Section 4.1 and summarized in **Table 4.6-1**. Acreage impacts presented in this section were calculated independently from the spatial data provided by Horse Heaven Wind Farm, LLC (Applicant) (Horse Heaven Wind Farm, LLC 2021a).

Table 4.6-1: Impact Rating Table for Wildlife and Habitat from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

4.6.1 Method of Analysis

In accordance with the Washington State Environmental Policy Act, this Environmental Impact Statement (EIS) weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors, including the Applicant's commitments, when determining the significance of identified potential impacts (WAC 197-11-330).

Applicant Commitments

The Applicant would incorporate an adaptive approach for the conservation of wildlife potentially impacted by the Project in coordination with the Technical Advisory Committee (TAC) prior to Project operation.

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 Application for Site Certification (ASC) and taken into consideration in the characterization of potential impacts on wildlife and habitat are discussed in Section 2.3 and summarized below (Horse Heaven Wind Farm, LLC 2022).

- To minimize impacts to wildlife, baseline studies were conducted at the Project consistent with the Washington Department of Fish and Wildlife (WDFW) Wind Power Guidelines (WDFW 2009), the U.S. Fish and Wildlife Service's (USFWS) 2012 Final Land-Based Wind Energy Guidelines (USFWS 2012), the 2013 USFWS Eagle Conservation Plan Guidance Module 1 – Land Based Wind Energy (USFWS 2013), and the USFWS 2016 Eagle Rule Revision (USFWS 2016). In order to mitigate and avoid impacts to wildlife resources, the Applicant used the results of these baseline studies to inform the Project's layout design.
- Project facilities were sited on previously disturbed (e.g., cultivated cropland) areas to the extent feasible to avoid impacts to native habitats and associated wildlife species.
- The Project will use industry standard best management practices to minimize impacts to vegetation, waters, and wildlife.
- The Applicant has drafted a Habitat Mitigation Plan (Appendix L of the 2022 ASC) for the wind energy generation areas of the Project, consistent with the Washington Department of Fish and Wildlife (WDFW) Wind Power Guidelines, where applicable (WDFW 2009). The Habitat Mitigation Plan addresses mitigation for the solar and BESS elements, consistent with best available industry practices. The Habitat Mitigation Plan includes provisions that specifically address minimizing impacts on ferruginous hawk and other raptors, along with criteria for how mitigation will be implemented to best address potential impacts to nesting ferruginous hawk and wildlife movement, while still complying with the WDFW Wind Power Guidelines (WDFW 2009)[30].
- To minimize impacts on wildlife, baseline studies were conducted at the Project consistent with the WDFW Wind Power Guidelines (WDFW 2009), the U.S. Fish and Wildlife Service's (USFWS) 2012 Final Land-Based Wind Energy Guidelines (USFWS 2012), the 2013 USFWS Eagle Conservation Plan Guidance Module 1 – Land-Based Wind Energy (USFWS 2013), and the USFWS 2016 Eagle Rule Revision (USFWS 2016). To mitigate and avoid wildlife resources, the Applicant used the results of these baseline studies to inform the Project's layout design.
- Project facilities would be sited on previously disturbed areas (e.g., cultivated cropland) to the extent feasible to avoid impacts on native habitats and associated wildlife species.
- The Project would use industry standard best management practices to minimize impacts on vegetation, water, and wildlife.
- To the extent feasible, the solar array fencelines have been designed to enclose smaller solar arrays within the Solar Siting Areas rather than enclosing each entire Solar Siting Area, which will minimize habitat fragmentation and allow wildlife passage through the Solar Siting Areas. Fencing will be designed to be at

[30] The proposed mitigation measures are expected to reduce impacts to ferruginous hawk and other raptors in concert with mitigation measures recommended in Section 4.6.2.5 The revised Appendix L: Draft Wildlife and Habitat Mitigation Plan describes criteria to be applied in selecting mitigation sites, monitoring and reporting requirements, and success criteria that describe how the Applicant would verify the effectiveness of mitigation.

least 4 inches above ground and will not have razor wire at the top. Consistent with recommended mitigation measure Spec-13 in the Draft Environmental Impact Statement (EFSEC 2022), the fencing will not be barbed wire.

- The Project would be sited outside of wetlands and waters to the extent feasible to avoid and minimize impacts on these resources, which would also avoid impacts on fish and minimize impacts on wildlife species that use these habitats.
- If the final design results in impacts on waters of the state that cannot be avoided, the Applicant would work with the Washington Energy Facility Site Evaluation Council (EFSEC) and WDFW to confirm whether a Hydraulic Project Approval is required and would prepare an application accordingly.
- Consistent with recommended mitigation measure Spec-4 in the Draft Environmental Impact Statement (EFSEC 2022), during construction, published WDFW PHS management recommendations WDFW-recommended seasonal buffers (per Larsen et al. 2004) for burrowing owl nests would be observed to avoid disturbing nesting burrowing owls, if present. If impacts to potentially suitable habitat cannot be avoided during final design, the Applicant would consult with WDFW regarding the need for burrowing owl surveys prior to construction, including surveys to determine habitat suitability for burrowing owls, and surveys for breeding owls if suitable habitat is present. The Applicant would minimize bird and bat collisions with Project infrastructure by implementing down-shield lighting (e.g. for permanent lighting at the substations and operations and maintenance [O&M] facilities) that would be sited, limited in intensity, and hooded in a manner that prevents the lighting from projecting onto any adjacent properties, roadways, and waterways; lighting would be motion activated where practical (i.e., excluding security lighting).
- The Applicant would acquire any required federal approvals as described in Section 2.23 of the ASC. The Applicant would continue ongoing coordination with the USFWS (Mathew Stuber, Eagle Coordinator, Columbia Pacific Northwest Region) regarding an eagle take permit for incidental take of bald and golden eagles and would continue to evaluate eagle risk to determine if an eagle take permit is appropriate considering the use of the Project area by bald and golden eagles.
- The Applicant has prepared a Bird and Bat Conservation Strategy that describes the surveys conducted, avoidance and minimization, and potential impacts to birds and bats and their habitat as a result of construction and operation of the Project (Appendix M of the ASC).
- The Turbine layouts presented in this Final ASC include a reduction in the total number of Turbines (reduced from the previous maximum of 244 Turbines to the current maximum of 231 Turbines for Option 1; and reduced from the previous 150 Turbines to the current maximum of 147 Turbines for Option 2). In addition, solar panels in proximity to I-82 have been removed, such that all panels will be approximately 1 mile east of I-82. These layout modifications result in a reduction in impacts to habitat and wildlife.

Collector and Transmission Lines

- The up-to-19-mile transmission line would be located in areas where the Applicant has site control and, to the extent possible, in areas where previous disturbance has occurred, thereby minimizing impacts on habitat and associated wildlife.
- Where applicable, the Project’s aboveground power lines and collection systems would be designed and constructed to minimize avian electrocution, referencing guidelines outlined in Avian Power Line Interaction

Committee standards (APLIC 2006, 2012). Overhead lines may be constructed in select locations to span intermittent streams, if applicable based on the final Project design.

- The underground communication cables and power collection system would be buried along the access roads in trenches extending from each of the turbines to the Project's substation where practicable; lines would be buried along both private and public rights-of-way.

Construction

Compliance and Reporting

- The Applicant would comply with all applicable federal, state, and local environmental laws, orders, and regulations.
- Prior to construction, all supervisory construction personnel would be instructed on the Bird and Bat Conservation Strategy and wildlife resource protection measures, including: 1) applicable federal and state laws (e.g., those that prohibit animal collection or removal) and 2) the importance of these resources and the purpose and necessity of protecting the resources, and ensuring this information is disseminated to applicable contractor personnel, including the correct reporting procedures.
- Construction personnel would be trained in the following areas when appropriate: awareness of sensitive bird species, potential bird nesting areas, potential bat roosting/breeding habitat, and general wildlife issues.
- Personnel would be instructed to use the Applicant's incidental reporting process to document bird or bat casualties during construction of the Project.

Roads

- Traffic would be restricted to roads associated with the Project; use of unimproved roads would be minimized to the extent possible. Following Project construction, temporary access roads made for component delivery and not needed for site operations would be restored to native vegetation.
- Speed limits would be set to ensure safe and efficient traffic flow; signs would be placed along roads, as necessary, to identify speed limits, travel restrictions, and other standard traffic control information.

Stormwater and Erosion

- A Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented, as required by the U.S. Environmental Protection Agency and the Washington Department of Ecology; the SWPPP would include standard sediment control devices (e.g., silt fences, straw bales, netting, soil stabilizers, check dams) to minimize soil erosion during and after construction.
- Stormwater management practices would be implemented to minimize open-water resources that can attract birds and bats.
- HHWF will be implemented for revegetation, soil stabilization, and erosion reduction measures to ensure temporary use areas are restored when no longer needed.
- A Temporary Erosion and Sediment Control Plan would be implemented for revegetation, soil stabilization, and erosion reduction measures to ensure that temporary use areas are restored when no longer needed.

Wildlife and Vegetation

- The existing road network would be used to reduce the need for road construction, as well as minimizing disturbance to Priority shrub-steppe habitat as defined by WDFW (2009). The Applicant would avoid siting Project components in wetlands and waterbodies.
- Per WDFW recommendations, wind turbine buffer zones would be established around known raptor nests (0.25-mile buffers) if site evaluations show that proposed construction activities would pose a risk of nest abandonment or failure to avian species of concern.
- During construction, WDFW-published seasonal buffers (per Larsen et al. 2004) for ferruginous hawk nests will be observed to avoid disturbing nesting ferruginous hawks. Brief human access and intermittent ground-based activities should be avoided within a distance of 250 meters (820 feet) of nests during the hawks' most sensitive period (March 1 to May 31). Prolonged activities (0.5 hour to several days) should be avoided, and noisy, prolonged activities should not occur, within 1 kilometer (0.6 mile) of nests during the breeding season (March 1 to August 15).
- Prior to construction, habitat surveys will be conducted within the Solar Siting Areas and portions of the Micrositing Corridor that were not surveyed in 2020 or 2021. These habitat surveys will focus on documenting areas of sagebrush shrub-steppe habitat. Sagebrush shrub-steppe habitat would be avoided to the extent possible. If avoidance is not possible, mitigation for impacts to sagebrush shrub-steppe habitat would be developed in consultation with the applicable agencies.
- All permanent met towers would be un-guyed to minimize collision risk for wildlife.
- During construction, existing trees, vegetation, water resources, and wildlife habitat would be protected and preserved to the extent practical.
- Noxious weed control measures would be implemented as specified by county, state, and federal requirements.
- All herbicide and pesticide mixing and applications would be conducted in accordance with all federal, state, and local laws and regulations and the specific product's label; herbicides and pesticides would only be directly applied to localized spots and will not be applied by broadcasting techniques
- The Applicant does not anticipate using pesticides during Project construction or operation. If unforeseen circumstances arise that require the use of pesticides, the Applicant would consult with WDFW and EFSEC regarding use of pesticides to avoid and minimize impacts to burrowing owl (per Larsen et al. 2004).
- The Applicant will limit construction disturbance by flagging any sensitive areas (e.g., wetlands, rare plant populations) and will conduct ongoing environmental monitoring during construction to ensure flagged areas are avoided.
- Gravel would be placed at least 5 feet around each turbine foundation to discourage small mammals and reptiles from burrowing under or near turbine bases.
- All trash would be covered in containers, and work sites would be cleared regularly of any garbage and debris related to food.
- Personnel's pets would not be allowed at the Project.

- To the extent feasible, the area required for Project construction and operation would be minimized. The Applicant would develop a restoration plan for restoring all areas of temporary disturbance to previous conditions, including the use of native species when seeding or planting during restoration. The restoration plan would ensure that:
  - All areas disturbed temporarily by Project construction would be restored, including temporary disturbance areas around structure construction sites, laydown/ staging areas, and temporary access roads.
  - Topsoil salvage would be included in all grading activities.
  - Conduct habitat restoration activities in accordance with obligations in the wind leases.

Operation and Maintenance

Operational Procedures

- The Applicant would conduct two years of standardized post-construction fatality monitoring to assess impacts of Turbine operation on birds and bats. Proposed post-construction fatality monitoring is described in the Applicant's BBCS (Appendix M of the ASC). The Applicant would also conduct five years of post-construction raptor nest monitoring, with specific emphasis on determining whether documented ferruginous hawk nests are active.
- All carrion (with the exception of birds and bats) discovered on site during regular maintenance activities would be removed and disposed of in an appropriate manner to avoid attracting eagles and other raptors; birds and bats discovered on site would be addressed in conformance with the Project's incidental reporting process and the post-construction fatality monitoring protocols.
- Appropriate stormwater management practices that do not create attractions for birds and bats would be implemented.
- Fire hazards from vehicles and human activities would be reduced (e.g., use of spark arrestors on power equipment, avoiding driving vehicles off roads, and allowing smoking in designated areas only).
- Vehicle speeds would be limited to 25 miles per hour to avoid wildlife collisions.
- Noxious weed control measures would be implemented, as specified by county, state, and federal requirements.
- Other than maintenance vehicles, which would park at the entrance of turbines for maintenance purposes, parts and equipment that can be used as cover for prey would not be stored at the base of turbines while turbines are operating.

Training

- All of the Applicant's employees and contractors working on site would receive worker awareness training for identifying and responding to encounters with sensitive biological resources, including avian and bat species. The training would:
  - Be conducted by the Applicant or the Applicant's designee

- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons
- Include instruction on identification and protection of plant and wildlife species and significant natural plant community habitats, microtrash and its effects, fire protection measures, and measures to minimize the spread of weeds during operation, as well as hazardous material spill and containment measures
- Include a flyer in the O&M building and/or construction trailer(s) detailing information on potential state and federal special status animal and plant species that could be discovered on the Project site
- Include a Wildlife Incident Reporting and Handling System that describes the steps O&M staff would take in the event of a wildlife fatality
- Include an overview of the distribution, general behavior, and ecology of golden and bald eagles. Employees would be informed that they are not authorized to approach, handle, or otherwise move any eagles, parts of eagles (i.e. feathers), eggs, or nests during construction or operation, regardless of whether the eagles are alive, injured, or deceased. In the event of an eagle fatality, a structured reporting system would be followed to notify the Applicant's project managers and follow the appropriate notification protocols to report the fatality to the USFWS within 24 hours of positive identification of the fatality as an eagle.

Ferruginous Hawk Avoidance and Minimization Measures

- Land leases along the Columbia River with private landowners were dropped from consideration to avoid development in proximity to suitable raptor nesting habitat along the cliffs adjacent to the river.
- In accordance with project-specific guidance provided by WDFW, Turbines nearest to Nest 03 were repositioned to be more than 0.5 mile away from the nest, which exceeded the 0.25-mile setback recommendation (M. Ritter, pers comm) exceeds published WDFW PHS guidance for ferruginous hawk (Larsen et al. 2004).
- Collection lines were co-located along existing roads and proposed access roads to reduce disturbance to raptor foraging habitat and interactions with aboveground electrical lines and poles.
- Project infrastructure was sited in previously disturbed areas to the extent feasible to avoid impacts to suitable ferruginous hawk foraging habitat in shrub-steppe and grassland habitats.
- Overhead electrical infrastructure will conform with Avian Power Line Interaction Committee suggested practices for reducing avian electrocution (APLIC 2006).
- All permanent meteorological towers will be unguyed to minimize collision risk for ferruginous hawks and other raptors.
- Development in and near draws and canyons was minimized to the extent practicable to reduce impacts to suitable raptor foraging and nesting habitat. For example, based on consultations with WDFW and EFSEC, collector lines originally planned to cross Webber and Sheep Canyons will be relocated south to near or above the head of the canyons.
- The Project will implement spatial and seasonal restrictions on ground-disturbing activities during construction, per WDFW recommendations (Larson et al. 2004; WDFW 2005).

- The Project will avoid the application of pesticide and rodenticides during the construction and operation

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.6.2.6, Post-Adjudication Applicant Commitments.

As identified in **Table 4.6-2**, impact magnitude is determined based on potential impacts on wildlife populations, considering the type of impact and context (adaptability and resiliency) of the existing conditions. The context of impacts is important in order to characterize the ability of a species to accommodate disturbance and how close a population is to its expected resilience and adaptability limits. = Adaptable wildlife species are those that can change their behavior, physiology, or population characteristics (e.g., reproduction rate) in response to a disturbance such that the integrity of the population remains unchanged. For example, certain wildlife populations can accommodate loss of some individuals without a change in overall population status or trajectory (known as compensatory mortality) (Connell et al.1984), or can adjust their physiology or behavior. Adaptable species can accommodate substantial disturbance and sometimes thrive in highly modified environments, whereas species with low adaptability can accommodate little or no disturbance.

Resilience is a concept that is distinct from, yet closely related to, adaptability. Biological populations often have inertia and will continue to function after disturbance up to the point where the disturbance becomes severe and long enough that the population undergoes a fundamental change. Adaptability influences the duration and magnitude of effect required for this to happen, whereas resilience defines the ability of a species or ecosystem to recover from disturbance. Highly resilient wildlife species have the potential to recover quickly from disturbance (e.g., after reclamation is achieved or a mortality source is removed), whereas species with low resilience will recover more slowly or may not recover at all (Weaver et al. 1996).

Table 4.6-2: Criteria for Assessing Magnitude of Impacts on Wildlife and Habitat

Magnitude of Impacts	Description
Negligible	The incremental change is so small that it is neither detectable nor measurable and is not anticipated to influence the viability of a wildlife population or species.
Low	The incremental change may be measurable and could result in a minor influence on the short-term viability of a wildlife population; however, it is expected to be within the natural population variability and resiliency of a species and therefore not expected to impact the viability of the species or population over a longer period of time.
Medium	The incremental change is expected to result in a clearly defined change that could result in changes to the population over shorter and longer periods of time; however, it remains below a level of impact that could exceed the resiliency and adaptability limits of the population.
High	The incremental change is sufficiently large that it approaches or falls within the range of impacts that could exceed the resilience and adaptability of the species or population, potentially impacting the viability of the species or population.

Potential interactions between wildlife and habitat and Project components/activities during construction, operation and maintenance, and decommissioning were identified based on information provided in the ASC for the Project. Interactions can generally be grouped into the following impacts: habitat loss, wildlife mortality, barriers to movement, and habitat fragmentation.

- Direct habitat loss (permanent and temporary) was quantified by habitat type. Methods to quantify direct loss are discussed in Section 4.5, Vegetation. Wildlife habitat loss is also qualitatively discussed using predicted distribution maps for state priority species, where available (NatureMapping n.d.). The final arrangement of the Project components has not been completed; therefore, habitat loss was conservatively estimated by calculating the loss associated with the Wind Energy Micrositing Corridor, East Solar Field, County Well Solar Field, and Sellards Solar Field. A description of these components can be found in Section 4.5.2.

- Indirect habitat loss may occur due to Project-related changes in habitat quality or use. Indirect habitat loss does not result in the removal of habitat (e.g., footprint loss), but rather in a change in the quality of habitat that may reduce its function for wildlife species (e.g., increased noise disturbance). Quantifying indirect habitat loss can be challenging because of limited research studies on species' response to changes in the landscape (e.g., attraction to or avoidance of an area due to anthropogenic changes and human activity). A simple and conservative approach to quantifying indirect habitat loss is to apply a zone of influence (ZOI) around Project components. The purpose of the ZOI is to quantify habitat surrounding Project components that may be degraded due to changes caused by humans (e.g., soundscape, lightscape). A 0.5-mile (0.8 kilometer) ZOI was applied to operational Project components (e.g. turbine, solar array, Micrositing Corridor) based on a literature review, the details of which are presented in Section 4.6.2.2.
- Sources of wildlife mortality that could result from the Project include collisions, strikes, consumption of toxic materials, and destruction of wildlife that becomes a nuisance (e.g., due to attraction to the Project). This assessment of potential wildlife mortality uses a combination of quantitative and qualitative methods. The Applicant measured the species-specific risk of collisions with the turbines using a bird exposure index. The exposure index was calculated using species' relative use, flight height, and flight time with data for these calculations collected through point count surveys conducted for small and large birds. The exposure indices provided by the Applicant have been used to assess mortality impacts on birds from the turbines. Bat species exposure indices were not calculated for the Project; however, bat mortality data from existing wind power projects were used to estimate potential bat mortality. Other sources of wildlife mortality (e.g., collisions with Project vehicles) are described qualitatively. Direct impacts on special status wildlife species, such as mortality, may be confined to the Lease Boundary and are therefore rated as "local"; however, loss of an individual could result in indirect impacts beyond the local scale through loss of genetic diversity and vulnerability to random events, meaning the population is vulnerable to loss of an individual as this loss increases the risk of the regional population to external pressures.
- Barriers to wildlife movement occur when Project features prevent or change species' ability to move over the landscape. Barriers can include physical constraints (e.g., fencing), as well as features that species may avoid crossing (e.g., roads). Barriers to movement are considered qualitatively in this assessment based on existing literature, modeled and known movement corridors in the Lease Boundary, and the proposed Project layout (e.g., Wind Energy Micrositing Corridor, solar arrays, and roadways).
- Habitat fragmentation occurs when extensive, continuous tracts of habitat are dissected into smaller, more isolated patches (Meffe and Carroll 1994; St-Laurent et al. 2009). Small, dispersed habitat patches may be less effective at providing the requisites of life, compared to larger continuous tracts for many wildlife species. The potential for the Project to fragment wildlife habitat was qualitatively analyzed using data on ecosystem distribution across the Lease Boundary and the proposed Project layout.

4.6.2 Impacts of Proposed Action

As noted in Section 4.6.1, Project-related impacts on wildlife and habitat can be broadly grouped into four general categories: direct habitat loss, indirect habitat loss, mortality, and barriers to movement/ fragmentation. The subsequent sections will provide a general discussion of the predicted Project-related impacts related to these four categories as they apply to that stage of the Project. Potential impacts on special status species are described separately from general wildlife and habitat impacts in Section 4.6.2.4. The Applicant has proposed a combination of turbine and solar array options. Turbine Option 1 would include installing up to 244 shorter (266-foot tower height, 499-foot blade height) turbines, while Option 2 would include installing up to 150 larger (557-foot tower height, 671-foot blade height) turbines. The Applicant has also proposed three different solar facility locations, though all three may not be constructed. Species-specific discussions are provided for special status species in Section 4.6.2.2 describing the Operation Stage, where an impact on that species is predicted.

4.6.2.1 Impacts during Construction

Impacts related to direct habitat loss, indirect habitat loss, wildlife mortality, and barriers to movement during construction are evaluated in this section.

Turbine Option 1 and Turbine Option 2

The Applicant has proposed two turbine options. Turbine Option 1 is generally expected to have a greater impact on habitat as construction of Turbine Option 1 will result in more direct loss than Turbine Option 2. Potential impacts on wildlife from indirect loss, mortality, and barriers to movement and fragmentation during construction are expected to be similar between the two options as both will require the construction of access roads and power lines, and mobilization of equipment. As such, the subsequent sections focus on the impacts of Turbine Option 1 as impacts from Option 2 are expected to be equal to or less than Option 1.

Habitat Loss from Construction of Turbines

The potential loss of habitat is considered greater for Turbine Option 1 (and was the only disturbance area provided by the Applicant); therefore, only this option is presented in **Table 4.6-4**. The Project would result in the direct loss of habitat through construction of the Wind Energy Micrositing Corridor and associated transportation routes. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.

Impacts from turbine construction under Turbine Option 1 and Turbine Option 2 are predicted to have a medium impact on habitat loss that is short term for temporary disturbances (e.g., construction laydown areas) and constant for permanent footprint loss (e.g., turbine footprint), unavoidable, and local to within 0.4 miles of construction areas.

Wildlife Mortality from Construction of Turbines

The Project may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) that are unable to move away from machinery during clearing and ground preparation work. Mobilization of equipment and construction-related traffic may result in wildlife-vehicle collisions during Project construction. Impacts from turbine construction under Turbine Option 1 and Turbine Option 2 are predicted to have a low-magnitude impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Construction of Turbines

Turbines, power lines, roadways, and other linear infrastructure could create barriers to wildlife movement and fragment habitat. Barriers to wildlife movement and habitat fragmentation initiated during construction are expected to continue through operation. Details of potential impacts from barriers to movement and habitat fragment are provided in Section 4.6.2.2.

Turbine construction under Turbine Option 1 and Turbine Option 2 is predicted to have a low-magnitude impact on barriers to movement and habitat fragmentation that is long term (as linear features, such as power lines, would remain through the Operation Stage), probable, and confined to the Lease Boundary.

Solar Arrays

Habitat Loss from Construction of Solar Arrays

The Project would result in the direct loss of habitat through construction of the solar arrays and associated transportation routes. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction. The solar array would result in direct loss of habitat for larger species, such as pronghorn antelope (*Antilocapra americana*). The solar arrays would be located within fenced areas that are expected to prevent large wildlife species from accessing habitat within the arrays, although the fence lines would surround the array clusters leaving space between the clusters accessible. As the configuration of solar arrays within the identified solar footprints has not been defined, this assessment assumes that habitat within the identified solar footprints would be lost to medium and large wildlife.

Table 4.6-3 presents the predicted habitat loss that would result from the three proposed solar facilities. Of the three, it is expected that the East Solar Field would have the greatest impact on vegetation communities, such as grasslands and shrublands, that provide complex and functional wildlife habitat. The County Well and Sellards Solar Fields would be situated predominantly on agricultural lands and thus would have less impact on such communities.

Construction of the solar arrays would have a medium impact on habitat loss that is short term for temporary disturbances (e.g., construction laydown areas in agricultural fields) and constant for permanent footprint loss, unavoidable, and confined to the Lease Boundary.

Wildlife Mortality from Construction of Solar Arrays

The Project may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) that are unable to move away from machinery during clearing and ground preparation works. Mobilization of equipment and construction-related traffic may result in wildlife-vehicle collisions during Project construction. Solar array construction is predicted to have a low-magnitude impact on wildlife mortality that is short term, feasible, and limited to the solar array fields, access roads, and ancillary facilities.

Table 4.6-3: Predicted Habitat Loss for the Solar Facilities

Habitat Type	East Solar Field		County Well Solar Field		Sellards Solar Field	
	Temporary Disturbance[b] (acres)	Permanent Disturbance[c] (acres)	Temporary Disturbance[b] (acres)	Permanent Disturbance[c] (acres)	Temporary Disturbance[b] (acres)	Permanent Disturbance [c] (acres)
Agriculture Land	85.6	1,075.1	30.0	2,580.4	85.0	1,934.0
Developed/Disturbed	2.7	<0.01	0.2	0	0.6	0
Grassland						
Eastside (Interior) Grassland[a]	7.9	72.5	0	0	0	0
Non-native Grassland	2.9	21.6	0.1	3.0	0.2	0
Planted Grassland	19.8	140.3	1.3	73.7	0.4	1.2
Shrubland						
Dwarf Shrub-steppe[a]	0	0	0	0	0	0
Rabbitbrush Shrubland	43.8	706.1	0	0	0	0
Sagebrush Shrub-steppe[a]	2.5	0.3	0	0	0.3	0
Total	**165.3**	**2,016.0**	**31.6**	**2,657.1**	**86.4**	**1,935.2**

Source: Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021.

Notes:

(a) Washington State Department of Fish and Wildlife Priority Habitats

(b) Temporary disturbance is defined as habitat loss that would end when construction is complete and the area would be restored to pre-construction conditions (WDFW 2009). Temporary disturbance from Project construction would occur in equipment laydown areas, construction staging areas, some roads, and areas required for construction that would not be part of the permanent infrastructure. These areas would be revegetated once construction is complete. Calculations of areas were completed independently using spatial data provided by the Applicant.

(c) Permanent disturbance is defined as habitat loss that would persist throughout the life of the Project and would not be restored when construction is complete (WDFW 2009). Permanent disturbance from Project construction (which extends into operation and decommissioning) would occur in the areas of the final tower footings and associated access roads, the substations, fencing around the solar arrays, and all areas occupied by permanent structures. Permanent disturbance also includes areas identified by the Applicant as modified habitat, which includes areas within the fencing around solar arrays. Disturbances include areas under Project footprint features (e.g., turbines) that would be restored during decommissioning. Calculations of areas were completed independently using spatial data provided by the Applicant.

Barriers to Movement and Habitat Fragmentation from Construction of Solar Arrays

Solar arrays, solar array perimeter fencing, power lines, roadways, and other linear infrastructure could create barriers to wildlife movement and fragment habitat. Barriers to wildlife movement and habitat fragmentation initiated during construction are expected to continue through operation. Details of potential impacts from barriers to movement and habitat fragment are provided as part of the discussion of operation impacts in Section 4.6.2.2.

Construction of the solar arrays is predicted to have a low-magnitude impact on barriers to movement and habitat fragmentation that is long term (as linear features, such as power lines, would remain through the Operation Stage), unavoidable, and confined to the Lease Boundary.

Battery Energy Storage Systems

Habitat Loss from Construction of Battery Energy Storage Systems (BESS)

The Project would result in the direct loss of habitat through construction of the BESS. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.

Construction of the BESS is predicted to result in a low-magnitude impact on habitat loss that is short term for temporary disturbances (e.g., construction laydown areas) and long term for permanent footprint loss, unavoidable, and limited to the areas of BESS construction.

Wildlife Mortality from Construction of BESS

The Project may result in mortality of smaller animals (e.g., birds, herptiles, and small mammals) that are unable to move away from machinery during clearing and ground preparation works. Mobilization of equipment and construction-related traffic may result in wildlife-vehicle collisions during Project construction. BESS construction is predicted to have a negligible impact on wildlife mortality that is short term, feasible, and limited in extent.

Barriers to Movement and Habitat Fragmentation from Construction of BESS

Construction of BESS may create barriers to wildlife movement in the adjacent area, resulting in an impact that is predicted to be negligible, long term, unavoidable, and limited to the BESS and surrounding area.

Substations

Habitat Loss from Construction of Substations

The Project would result in the direct loss of habitat through construction of the substations. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.

Similar to the construction of BESS, substation construction would have a low-magnitude impact on habitat loss that is short term for temporary disturbances (e.g., construction laydown areas) and long term for permanent footprint loss, unavoidable, and limited to the construction area.

Wildlife Mortality from Construction of Substations

Similar to wildlife mortality associated with the construction of the BESS, construction of substations may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) that are unable to move away from machinery during clearing, ground preparation works, equipment mobilization, and traffic and is predicted to result in a negligible impact on wildlife mortality that is short term, feasible, and limited in extent.

Barriers to Movement and Habitat Fragmentation from Construction of Substations

Construction of substations may create barriers to wildlife movement in the adjacent area, resulting in an impact that is predicted to be negligible, long term, unavoidable, and limited to the substations and surrounding area.

Comprehensive Project

Habitat Loss from Comprehensive Project

Site clearing and grubbing is one of the most noticeable effects of the Project. The Applicant estimates that 593 acres of terrestrial vegetation would be permanently lost, 2,957 acres temporarily disturbed (e.g., temporary access roads), and 6,570 acres modified (e.g., under solar arrays) during the Construction Stage of the Project to accommodate the installation of Project infrastructure (e.g., turbines, roadways, solar arrays). Temporarily lost habitat would be restored after construction; however, the impact from permanently lost and modified habitat would persist throughout the Operation Stage and a portion of the Decommissioning Stage until habitat functions in restored areas (e.g., sage brush) are re-established. The removal of vegetation reduces the landscape's capability to support wildlife. The effects of site clearing on habitat loss on wildlife species would vary with the time of year and the characteristics of the habitat being cleared. Although habitat is required for wildlife to exist, it is unlikely that there will be a linear relationship between wildlife abundance and habitat availability. The relationship between population density and the availability of habitat is influenced by many factors that may operate independently of habitat, including population densities of the target species and other species in the study area, and the effects of predation pressure, competition, and harvest (Garshelis 2000). The predicted modified, temporary, and permanent losses of habitat are summarized in **Table 4.6-4**, and further details can be found in Section 4.5.

Table 4.6-4: Total Acres of Habitat Types and Subtypes Identified by the Applicant for Temporary and Permanent Disturbance in the Wind Energy Micrositing Corridor, Solar Siting Areas, and Comprehensive Project in Comparison to Total Habitat Available in the Lease Boundary

Habitat Type	Wind Energy Micrositing Corridor (Turbine Option 1)		Solar Siting Areas		Comprehensive Project		Total Habitat Available in the Lease Boundary (acres)
	Temporary Disturbance[b] (acres)	Permanent Disturbance[c] (acres)	Temporary Disturbance[b] (acres)	Permanent Disturbance[c] (acres)	Temporary Disturbance[b] (acres)	Permanent Disturbance[c] (acres)	
Agriculture Land	2,263.9	391.2	200.6	5,589.5	2,323.9	5,802.8	53,450.1
Developed/Disturbed	19.3	1.5	3.5	0.01	19.3	1.6	855.7
Grassland							
Eastside (Interior) Grassland (Eastside Steppe)[a]	15.3	5.4	7.9	72.5	16.2	72.5	173.5
Non-native Grassland	136.0	11.5	3.2	24.7	137.3	36.1	1,635.5
Planted Grassland	259.8	23.3	21.5	215.3	263.0	236.0	4,338.3
Unclassified Grassland	0	0	0	0	0.01	0	6,125.2
Shrubland							
Dwarf Shrub-steppe[a]	8.9	1.1	0	0	8.9	1.1	23.2
Rabbitbrush Shrubland	145.0	41.6	43.8	706.1	152.3	717.2	3,037.7
Sagebrush Shrub-steppe[a]	31.4	1.1	2.8	0.3	31.4	1.4	1,372.0
Unclassified Shrubland	0	0	0	0	<0.01	0	1,436.6
Total	**2,879.6**	**476.6**	**283.3**	**6,608.3**	**2,952.2**	**6,868.7**	**72,427.9**

Sources: Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021

Notes: Areas of overlap between temporary and permanent disturbance are only counted toward permanent disturbance. The sum of the acres within disturbance areas of the Wind Energy Micrositing Corridor and Solar Siting Areas may not equal the comprehensive Project due to overlapping areas. Modified habitat was calculated as the area within the solar fence line.

Disturbance areas were not provided by the Applicant for Turbine Option 2

(a) Washington State Department of Fish and Wildlife Priority Habitats

(b) Temporary disturbance is defined as habitat loss that would end when construction is complete and the area would be restored to pre-construction conditions (WDFW 2009). Temporary disturbance from Project construction would occur in equipment laydown areas, construction staging areas, some roads, and areas required for construction that would not be part of the permanent infrastructure. These areas would be revegetated once construction is complete. Calculations of areas were completed independently using spatial files provided by the Applicant (Horse Heaven Wind Farm, LLC 2021a).

(C) Permanent disturbance is defined as habitat loss that would persist throughout the life of the Project and would not be restored when construction is complete (WDFW 2009). Permanent disturbance from Project construction (which extends into operation and decommissioning) would occur in the areas of the final tower footings and associated access roads, the substations, fencing around the solar arrays, and all areas occupied by permanent structures. Permanent disturbance also includes areas identified by the Applicant as modified habitat, which includes areas within the fencing around solar arrays. Disturbances include areas under Project footprint features (e.g., turbines) that would be restored during decommissioning. Calculations of areas were completed independently using spatial files provided by the Applicant (Horse Heaven Wind Farm, LLC 2021a)..

Indirect habitat loss during construction could result from increased noise, light, and human presence on site during construction activities. Wildlife species responses to these changes are variable, with some species acclimatizing to activities and others avoiding areas under construction (Schöll and Nopp-Mayr 2021). Potential disturbances from construction would be restricted to the two-year construction period. During this period, it is expected that the magnitude of the impact could vary depending on the construction activities performed and location of these activities. Details on construction-related noise impacts are provided in the noise impact analysis presented in Section 4.11; however, the Applicant generally predicts sound pressure levels from construction equipment to range from 69 to 84 A-weighted decibels (dBA)[31] at 50 feet and 26 to 41 dBA at 2,000 feet linear distance from the noise source. The Applicant expects that existing ambient noise levels are approximately 30 dBA, although site-specific data have not been presented. The Applicant reports that Project construction activities would predominantly occur during daylight hours, thereby reducing potential nighttime disturbance to wildlife from construction noise and light.

It is expected that most mobile species, such as birds and mammals, would demonstrate some avoidance behavior during the construction period, resulting in a reduction of usable habitat in the Lease Boundary during this period. Based on noise data presented by the Applicant, disturbance could extend at least 2,000 feet (0.4 miles) from the source. As indirect impacts from the Project, including noise, light, and human presence, are predicted to persist into the Operation Stage, this impact is quantified further in Section 4.6.2.2.

The Project would result in the direct loss of habitat through construction of the comprehensive Project. The Project would result in the direct loss of habitat through construction of the Wind Energy Micrositing Corridor, solar arrays, BESS, substations and associated transportation routes. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.

Construction of the comprehensive Project is predicted to have a medium impact on habitat loss that is short term for temporary disturbances (e.g., construction laydown areas) and constant for permanent footprint loss, unavoidable, and local to within 0.4 miles of construction areas.

Wildlife Mortality from Comprehensive Project

Wildlife mortality can occur from incidents such as wildlife-vehicle collisions and bird strikes with infrastructure. This section is limited to general impacts on wildlife from Project-related mortality. Impacts on special status species are discussed separately in Section 4.6.2.4. These effects can be difficult to predict as data may be hard to obtain and are often incomplete when available (Berger 1995; Lehman et al. 2010). Sources of wildlife mortality during Project construction may include:

- Mortality from clearing and grubbing activities
- Wildlife-vehicle collisions
- Nest/den destruction and failure
- Removal of nuisance wildlife

[31] Sound pressure measurements are presented in dBA, which is weighted to human hearing levels that may not be directly comparable to hearing thresholds for wildlife as the weighting removes low and high frequencies that may be audible to some species but not to humans.

Less mobile animals, such as herptiles, may not be able to move away from machinery used for clearing and grubbing and are susceptible to mortality during these activities. Species may be more susceptible during specific times of the year. For example, amphibians are typically less mobile while in the larval life phase (spring/summer) and while hibernating over winter. The Project may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) during clearing and ground preparation works, although a quantitative estimate of mortality has not been provided in the ASC.

Wildlife-vehicle collisions may occur when roads bisect habitat, requiring wildlife to cross roads to access adjacent areas. Wildlife-vehicle collisions may occur during Project construction, operation, and decommissioning; however, vehicle traffic is expected to be highest during the Construction Stage. Road mortalities are generally site-specific, and frequencies depend on the species and circumstances such as location, traffic volume, and speed (Jalkotzy et al. 1997; Oxley et al. 1974). For example, amphibians are particularly susceptible to vehicle-wildlife collisions when moving between habitat types, including to and from breeding sites, and when emerging young are dispersing (Fukumoto and Herrero 1998). Collisions are typically more common during dusk and nighttime, when nocturnal species are active and visibility is poor (Gunson et al. 2004).

Birds are often killed on roads (Jalkotzy et al. 1997). While bird species whose habitats are bisected by roads are vulnerable to some extent, specific levels of the effect are not commonly reported. Raptors and owls are susceptible to road kills because of their propensity for hunting small mammals within road allowances and scavenging road-killed animals. Rates of road-based mortality are typically specific to individual projects and can be influenced by the location of roads in unique habitat (e.g., wetlands), traffic volume, work hours, and vehicle speed.

Clearing and site preparation work may result in destruction or disturbance of bird nests or small mammal dens. Adult birds would be able to move away from clearing activities, but their young may not be able to move if clearing is conducted prior to fledging. Birds may abandon nests, and direct mortality may occur if clearing is conducted during the nesting season. Small mammal dens may be destroyed during ground-disturbing works, resulting in mortality of animals in the den. The magnitude of potential mortality is expected to vary depending on the season when work is conducted. For example, clearing work that takes place during the bird breeding season is expected to have greater risk of bird mortality due to the presence of bird nests, eggs, and fledglings than if such work is performed during the winter.

Wildlife may be attracted to construction sites, particularly if waste materials are not well managed. Wildlife attraction to a site can result in increased conflicts with workers and require removal of nuisance individuals. Urbanized species, such as coyote (*Canis latrans*) and raccoon (*Procyon lotor*), are tolerant of human presence and are more likely to access active construction sites to scavenge.

The Project may result in mortality of smaller animals (e.g., birds, herptiles, and small mammals) that are unable to move away from machinery during clearing and ground preparation works. Mobilization of equipment and construction-related traffic may result in wildlife-vehicle collisions during Project construction. Construction of the comprehensive Project is predicted to have a low-magnitude impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Comprehensive Project

Project components could create barriers to wildlife movement and fragment habitat during construction. Barriers to wildlife movement and habitat fragmentation initiated during construction are expected to continue through operation. Details of potential impacts from barriers to movement and habitat fragment are provided in Section 4.6.2.2.

Construction of the comprehensive Project is predicted to have a low-magnitude impact on barriers to movement and habitat fragmentation that is long term (as linear features, such as power lines, would remain through the Operation Stage), probable, and confined to the Lease Boundary.

4.6.2.2 Impacts during Operation

Impacts predicted to occur during the Operation Stage of the Project include indirect habitat loss (disturbance), wildlife mortality, barriers to movement, and fragmentation. Additional direct habitat loss is not predicted to occur during the Operation Stage, although permanent loss (identified under Section 4.6.2.1) would continue throughout Project operation. These impacts are not discussed further in this section.

Turbine Option 1 and Turbine Option 2

The impacts on wildlife and wildlife habitat from Turbine Option 1 and Turbine Option 2 are expected to be similar through the Operation Stage. Therefore, the assessment of potential impacts of these options is combined in the sections below.

Habitat Loss from Operation of Turbines

Habitat directly lost during the construction of the Micrositing Corridor would persist through the Operation Stage. The Project may also result in indirect habitat loss through degradation of habitat in the 0.5-mile ZOI created by disturbances (e.g., noise, light) from turbines and associated infrastructure.

Impacts from turbine operation under Turbine Option 1 and Turbine Option 2 are predicted to have a medium-magnitude impact resulting in habitat loss that is constant, unavoidable, and local within 0.5 miles of turbines.

Wildlife Mortality from Operation of Turbines

Collisions of aerial wildlife species (e.g., birds and bats) with turbines are well documented and are expected to be the most notable potential source of mortality associated with the Project. The consequence of wind power projects on regional aerial wildlife populations varies by species group and project location. For example, available data from existing facilities suggest that passerine mortalities associated with turbine collisions may not result in population-level changes (Arnett et al. 2007); however, projects situated near populations of rare species or unique stopover locations could result in more substantial changes (Arnett et al. 2007). In a synthesis of literature, Arnett et al. (2007) reported that bird mortalities are typically evenly distributed between nocturnally migrating passerines and resident birds. This may be attributed to the flight altitude of migrating birds, including those migrating at night, which is often above the rotor-swept zone, thereby reducing risk of collision with turbines (Krijgsveld et al. 2009). Mortalities occur year-round, peaking from April to October (Arnett et al 2007).

Migrating birds are at greatest risk of collision with turbines during dawn and dusk when landing and leaving terrestrial stopover habitats requires flights through the rotor-swept zone. In addition, several studies report that migrating bird mortalities increased with poor weather conditions as these conditions force birds to fly at a lower altitude (e.g., Kerlinger et al. 2010). Further, features of the facilities, such as lighting, may attract migrating birds, though this has not been the case with flashing red lights (FAA 2012). Blinking white or red lighting has been shown to reduce bird collisions compared to steady lighting (Gehring et al. 2009) and may reduce bat collisions compared to turbines with no lighting (Hein and Schirmacher 2016). The Applicant reports that turbine lighting is not predicted to change the mortality rate (increase or decrease) at turbines (Horse Heaven Wind Farm, LLC 2021b).

Migration routes are influenced by several factors, such as the presence of stopover sites (e.g., wetlands) and ridgelines, which vary across guilds (a guild is a group of species, such as waterfowl, that occupy the same ecological role). The Applicant reports that the Lease Boundary does not provide high quality stopover habitat, such as riparian areas or wetlands, commonly used by multiple guilds; although croplands, shrubland, and grassland habitat could be used by migrating birds for foraging. North/south ridgelines that may be used by migrating raptors are predominantly located west of the Project and adjacent to the Yakima River. The Yakima and Columbia Rivers are both over 2 miles from the Project (Appendix K,[32] Horse Heaven Wind Farm, LLC 2022).

Nocturnal migration surveys conducted at the Nine Canyon, Stateline, and Vansycle wind energy facilities reported that most migrating birds (86 percent) flew at altitudes above 262 feet(80 m) (Appendix K,[2] Horse Heaven Wind Farm, LLC 2022). Nocturnal migration surveys were not conducted in the Lease Boundary.

The ASC uses a species-specific exposure index to assess the potential risk of bird mortality from collisions with the proposed turbines. The index was developed from avian use survey data collected in the Lease Boundary. The Applicant concluded that the Project may result in a bird fatality rate similar to that of the nearby Nine Canyon Wind Project (2.6 birds per megawatt [MW] per year), also located in Benton County. The fatality rate at the Nine Canyon Wind Project is slightly higher than the Pacific regional average of 2.4 birds per MW per year (Horse Heaven Wind Farm, LLC 2022).

The Applicant reports that horned lark (*Eremophila alpestris*), gray partridge (*Perdix perdix*), golden-crowned kinglet (*Regulus satrapa*), ring-necked pheasant (*Phasianus colchicus*), and chukar (*Alectoris chukar*) are commonly reported in fatality data and predicts that horned lark is the species most likely to be impacted by the Project, given its abundance within the Lease Boundary and susceptibility to wind power developments. This species is ranked as Apparently Secure (S4) in the State of Washington, though breeding bird survey data suggest an annual decrease (-2.3 percent) in North America, and western states also report population declines (Beason 2020). Further, studies show that for small passerine (e.g., songbird) species, turbine-related mortalities resulting from currently developed wind farms constitute a small percentage of their total population size (<0.045 percent) (Erickson et al. 2014) and do not appear likely to lead to population-level impacts (AWWI 2020).

The potential risk of bird mortality was evaluated for the two turbine options (Option 1 with up to 244 turbines with 266-foot tower height and 499-foot blade height and Option 2, with up to 150 turbines with 557-foot tower height and 671-foot blade height). It is predicted that Turbine Option 1 would result in a higher risk of collisions for small birds and raptors than Option 2 (GAL 2022; **Appendix 4.6-1**). Waterfowl may be more susceptible to collisions with the taller turbines in Option 2; however, raptors are reported to have higher exposure indices for shorter turbines than taller turbines and therefore are considered to be more susceptible to collisions with turbines under Option 1 (see GAL 2022). The Project design has been reconfigured to reduce potential interactions with large waterfowl, such as the American white pelican (*Pelecanus erythrorhynchos)* (see Section 4.6.2.4).

Collision with turbines is considered one of the greatest threats to bats in North America (O'Shea et al. 2016). Bat mortalities are dominated by three species: hoary bat, silver-haired bat (*Lasionycteris noctivagans*), and eastern red bat (*L. borealis*, does not occur in Washington State). Based on data from 52 wind farms in Washington, hoary and silver-haired bats made up 52 and 44 percent of reported bat mortalities, respectively (WEST 2021). Considering that only three species account for most bat mortalities resulting from turbine collisions, population-

[32] Chatfield, A., and J. Thompson (WEST). 2018. Site Characterization Study Report: Badger Canyon Wind Project, Benton County, Washington. Prepared for Badger Canyon MW LLC.

level impacts on these species may become an issue as the number of wind farms increases (Barclay et al. 2007; Hein and Schirmacher 2016; Zimmerling and Francis 2016). Demographic modeling suggests that mortality from wind turbines may substantially reduce population size of the hoary bat and increase its risk of extinction (Frick et al. 2017). Friedenberg and Frick (2021) projected hoary bat (*Lasiurus cinereus*) mortality due to future wind power development and estimated the corresponding impact on hoary bat populations. Projections estimated that wind power development could result in mortality levels of 3 to 46 percent of the hoary bat population by 2050 depending on a range of assumed baseline population size (1 to 10 million bats) and low or high project build out (Friedenberg and Frick 2021). Depending on current bat populations and the extent of wind power build out, hoary bat populations could drop below extinction thresholds over the 20 to 30 years (Friendenberg and Frick 2021). Bat mortalities are most frequently reported in late summer to early fall (90 percent) during fall migration (Arnett et al. 2007).

The bat fatality rate at the nearby Nine Canyon Wind Project was 2.47 bats per MW per year and consisted entirely of hoary and silver-haired bats (Horse Heaven Wind Farm, LLC 2022). Bat mortality rates reported for the Rocky Mountains region range from 1.05 to 11.42 bats/MW/year, averaging 4.90 bats/MW/year. Fatality rates from facilities in the Pacific Northwest, including the Columbia Plateau, range from 0.12 to 4.23 bats/MW/year, averaging 1.19 bats/MW/year. Estimated bat average bat mortality rates have decreased by 5.3 percent to 1.08 bats/MW/year (Jansen et al 2023). If the bat fatality rate at the Project is similar to the rate at the Nine Canyon Wind Project and the average reported rate from the Pacific Northwest, the Project could result in 110 to 3,810 bat fatalities per year, averaging approximately 1,070 to 2,220. These mortality ranges are consistent with estimated Project-related annual bat fatalities analyzed by WDFW (Ritter 2023). The Applicant predicted that bat mortalities during operation of the Project would:

- Be within the range of other facilities in Washington
- Consist primarily of migratory, tree-roosting species (e.g., silver-haired bat, hoary bat)
- Occur mainly in the fall
- The relationship between turbine height and bat collision mortalities is inconclusive, and it is unclear which turbine option would result in greater impacts on bats. Bat fatality is also unlikely to be evenly distributed across the Project. (Horse Heaven Wind Farm, LLC 2022)

Turbine operation under Turbine Option 1 and Turbine Option 2 is predicted to have a medium impact on wildlife mortality that is long term, probable, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Operation of Turbines

The operation of turbines, power lines, roadways, and other linear infrastructure could result in barriers to wildlife movement and fragment habitat. Barriers and fragmentation created during construction would predominantly remain through operation. The Applicant notes that the Project has been designed to avoid impacts on movement corridors by siting turbines and associated roads such that approximately 11 turbines are located in the high linkage area running north/south (Horse Heaven Wind Farm, LLC 2022). Turbines have not been sited in the linkage area that runs east/west along the ridgeline. Turbine operation under Option 1 and Option 2 is predicted to have a medium impact on barriers to movement and habitat fragmentation that is long term, probable, and confined to the Lease Boundary.

Solar Arrays

Habitat Loss from Operation of Solar Arrays

Habitat directly lost during construction of the solar arrays would predominantly persist through the Operation Stage into decommissioning, though areas under the solar arrays (modified habitat) may continue to provide habitat with reduced or altered function. Habitat under solar arrays would be revegetated with a grass mix, which is expected to provide foraging and shelter habitat for some species (e.g., small mammals); however, this would not provide the same ecological role or function as mature native sagebrush habitat. Operation of the solar arrays may also result in indirect habitat loss through degradation of habitat in the 0.5-mile ZOI created by disturbances from solar arrays and associated infrastructure.

Solar array operation is predicted to have a medium impact on habitat loss that is constant, unavoidable, and confined to the Lease Boundary.

Wildlife Mortality from Operation of Solar Arrays

There is limited published literature on fatality rates associated with solar facilities. It is postulated that water-associated birds (e.g., herons) and water obligates are more likely to interact with solar facilities because these species may perceive the facilities as waterbodies when they are in flight, a phenomenon known as the “lake effect.” In a synthesis of monitoring studies from 10 facilities, Kosciuch et al. (2020) reported taxonomic variability in the bird fatalities observed at different solar sites; however, mourning doves (*Zenaida macroura*), horned larks, and western meadowlarks (*Sturnella neglecta*) were reported at all sites. Mortalities of water-associated birds and water obligates occurred at most solar sites in the Sonoran and Mojave Deserts Bird Conservation Region but were less common in the Great Basin and Coastal California Bird Conservation Regions. Further, most of these fatalities involved ground-dwelling species (three out of four most common species detected) and were detected during the fall. Kosciuch et al. (2020) estimated an annual fatality rate of 2.49 fatalities per MW per year at facilities in the southwestern United States.

It has been demonstrated that bats may not be able to detect the difference between water and other smooth surfaces in laboratory settings (Greif and Siemers 2010; Russo et al. 2012), which could increase their risk of collision with solar arrays. However, there is limited information on the frequency of bat mortalities at these locations, and Russo et al. (2012) noted that bats typically moved to alternative locations after failed drinking attempts.

Mortality of other wildlife groups, such as amphibians, herptiles, and mammals, due to solar arrays is poorly understood. Changes in ground temperature and water conditions could impact wildlife survivorship within array footprints; however, the extent of the effect is not well understood.

Solar array operation is predicted to have a low-magnitude impact on wildlife mortality that is long term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Operation of Solar Arrays

Fencing for the solar arrays would be limited to the panel clusters, rather than encompassing the entire facility footprint. Fencing is expected to create barriers for larger mammals, such as pronghorn antelope, from accessing habitat around the arrays. Herptiles, small mammals, and small birds are expected to be able to continue to access vegetation around the arrays through the fencing. The east solar field would be situated on a movement corridor and may impact wildlife movement. The potential loss or alteration of the habitat around the arrays has already been considered in the discussion of direct and indirect loss, above.

Solar array operation is predicted to have a medium-magnitude impact on barriers to movement and habitat fragmentation that is long term, probable, and confined to the Lease Boundary.

Battery Energy Storage Systems

Habitat Loss from Operation of BESS

Habitat directly lost during construction of the BESS would predominantly persist through the Operation Stage. Operation of the BESS may also result in indirect habitat loss through degradation of habitat in the 0.5-mile ZOI created by disturbances from these features.

BESS operation is predicted to have a negligible impact on habitat loss that is long term, unavoidable, and limited to the BESS and surrounding area.

Wildlife Mortality from Operation of BESS

Wildlife mortality may occur due to collisions with infrastructure, including BESS. BESS operation is predicted to have a negligible impact on wildlife mortality that is long term, unlikely to occur, and limited to the BESS areas.

Barriers to Movement and Habitat Fragmentation from Operation of BESS

BESS may create barriers to wildlife movement by altering wildlife movement through and around the BESS and adjacent areas. BESS operation is predicted to have a low impact on barriers to movement and habitat fragmentation that is long term, feasible, and limited to the BESS areas.

Substations

Habitat Loss from Operation of Substations

Habitat directly lost during construction of the substations would predominantly persist through the Operation Stage. Operation of the substations may also result in indirect habitat loss through degradation of habitat in the 0.5-mile ZOI created by disturbances from these features.

Substation operation is predicted to have a negligible impact on habitat loss that is long term, unavoidable, and limited to the substation and surrounding area.

Wildlife Mortality from Operation of Substations

Wildlife mortality may occur due to collisions with infrastructure, including substations. Substation operation is predicted to have a negligible impact on wildlife mortality that is long term, unlikely to occur, and limited to the substation areas.

Barriers to Movement and Habitat Fragmentation from Operation of Substations

Substations may create barriers to wildlife movement by altering wildlife movement through and around the substations and adjacent area. Substation operation is predicted to have a low impact on barriers to movement and habitat fragmentation that is long term, feasible, and limited to the substation areas.

Comprehensive Project

Habitat Loss from Operation of Comprehensive Project

As indicated in the 2022 ASC, in addition to direct impacts of wind turbines, solar arrays, and associated infrastructure on wildlife, indirect impacts on wildlife could occur (Horse Heaven Wind Farm, LLC 2022), such as:

- **Displacement:** Wind turbines could cause displacement of wildlife from proximal habitats due to sensory disturbance, such as noise and visual distraction, which can effectively cause habitat loss (Drewitt and

Langston 2006). Multiple studies indicate that bird and mammal abundance decreases with increasing proximity to infrastructure such as wind turbines (Benítez-López et al. 2010; Drewitt and Langston 2006; Smith et al. 2020).

- **Change in Behavior:** Species may change their behavior to avoid specific components of the Project or the Lease Boundary. For example, birds may alter their flight paths to avoid contact with wind turbines. Altered flight paths could require additional energy expenditure, which in turn impacts individual fitness (Drewitt and Langston 2006).

Displacement as an indirect impact can equate to a type of habitat degradation or loss (Drewitt and Langston 2006). While the habitat is still present, it is no longer functional or providing the same resources to wildlife. Indirect impacts on wildlife due to avoidance and behavioral changes are the greatest habitat-related impacts from wind power facilities because the impacts increase wildlife habitat fragmentation (Arnett et al. 2007). It is acknowledged that the response and the magnitude of indirect impacts from wind turbines vary among species; however, multiple studies have found that infrastructure, including wind turbines, causes indirect impacts on wildlife and wildlife habitat that are greater than the sum of the direct habitat loss impacts (Benítez-López et al. 2010). Changes in ambient conditions such as noise, light, and visual scape due to Project operation may result in a change in wildlife behavior; however, the extent and duration of these changes are difficult to predict and require some inferences from other industries.

Noises above certain levels tend to alter wildlife behavior, potentially increasing their metabolic rates and stress levels (Manci et al. 1988) and contribute to increased energy expenditures due to increased movement around infrastructure (Bradshaw et al. 1997). Depending on the timing and level of stress, potential results of stresses include interference with communication and reduced reproductive success (Habib et al. 2007). For example, noise may cause changes in the frequency and duration of amphibian calling effort and may result in a reduction in the pairing success of birds due to interference with communication (Lengagne 2008; Habib et al. 2007). A synthesis of literature on the effects of noise on wildlife suggests that terrestrial wildlife generally respond to noise levels around 40 dBA, with most showing impacts around 50 dBA (Shannon et al. 2016).

There is a lack of literature available examining the impacts of light on wildlife. It is often difficult to separate the combined influence of industrial noise, artificial light, and edge effect on wildlife species. Artificial light has the potential to affect the timing of reproductive behavior of wildlife species (Kempenaers et al. 2010). The Project is anticipated to require security lighting at the substations, O&M facilities, and BESS. In addition, FAA requirements dictate that aviation lighting would be required on the turbine nacelles, along with mid-tower lighting for turbines with blade tip heights above 599 feet. Lighting would also be required on the four permanent met towers. FAA lighting would not be steady but rather would be blinking. In addition, the use of Aircraft Detection Lighting Systems (ADLS) would reduce the duration that blinking lights are active. Nighttime light trespass modeling has not been conducted. The potential impacts of FAA lighting are expected to vary across species. Blinking lights may reduce bird and bat collisions, suggesting that these animals may be modifying their flights to avoid vertical structures.

Several studies have estimated distances from wind turbines where wildlife may be disturbed. For example, Leddy et al. (1999) reported decreased breeding bird densities within 262 feet (80 meters) of turbines, while Johnson et al. (2000) and Erickson et al. (2004) reported lower densities of grassland birds within 328 feet (100 meters) of turbines. Shaffer and Buhl (2016) reported that species are often displaced within 328 feet (100 meters) and can extend beyond 984 feet (300 meters). Similarly, breeding passerine densities are lower on Conservation Reserve Program (CRP) land with wind turbines compared to CRP land without turbines in grassland ecosystems (Leddy 1996). Densities of songbirds increase with increasing distances from wind turbines, and avoidance was attributed to disturbance from noise and wind turbine maintenance (Leddy 1996).

Studies conducted at the Buffalo Ridge Wind Farm in southwestern Minnesota reported that no raptor nests were recorded within the 7,907 acres (32 square kilometers [km^2]) occupied by that project, though raptor nest density away from the project was measured at 5.94 nests per 24,710 acres (100 km^2) (Usgaard et al. 1997). Other studies suggest that some raptor species may nest 0.5 miles (800 meters) from wind power facilities (Arnett et al. 2007), and Garvin et al. (2011) reported a 47 percent reduction in raptor abundance in proximity to wind turbines, with most individuals remaining at a distance at least 328 feet (100 meters) from turbines. Disturbance was estimated to be larger, approximately 1 mile (1,600 meters), for greater prairie-chickens (*Tympanuchus cupido*) (Robel 2002). Wind farms may also be avoided by waterfowl and water-associated birds, which have been reported to be deterred at distances within 328 feet (100 meters) to 1,970 feet (600 meters) from turbines (Larsen and Madsen 2000; Rees 2012).

Bat activity may also vary near turbines, with some studies suggesting that bat activity may be reduced within approximately 0.6 miles (1,000 meters) of wind power projects (Barré et al. 2017), and others suggesting that bats may be attracted to wind farms (Richardson et al. 2021). Łopucki et al. (2017) reported that herbivorous mammals seemed to avoid areas within 0.44 miles (700 meters) of wind farms. A study of female pronghorns before and after wind turbine development found that pronghorns avoided wind turbines that were constructed within their winter range. Areas within the home range that were previously used prior to wind turbine construction were subsequently avoided during the winters following construction (Smith et al. 2020). As reported by the Applicant, disturbance and displacement may not occur immediately after construction or onset of operation but could occur over time (Horse Heaven Wind Farm, LLC 2022).

Similarly, there are limited data describing changes in wildlife behavior and densities in response to solar array operation (Chock et al. 2020; Lovich and Ennen 2011). Lovich and Ennen (2011) suggest that operation of solar facilities could result in a variety of disturbance impacts on wildlife such as noise impacts, electromagnetic field impacts, microclimate impacts, pollution, water consumption, fire impacts, and light impacts. Chock et al. (2020) noted that habitat changes from solar arrays may influence wildlife movement patterns, reproductive success, and physiological stress. Habitat modifications and isolation (e.g., fencing) associated with solar arrays may alter predator and antipredator behavior (e.g., predator avoidance). For example, insects and other species that are attracted to light could be drawn to solar arrays, resulting in increased density and activity of insectivorous species (Chock et al. 2020). Conversely, fencing and shelter produced by solar arrays may attract smaller prey species because these features of the arrays may reduce predation success.

Species that can acclimatize to modified environments may not display avoidance behavior around wind power facilities (Johnson et al. 2000), though they may avoid specific components of the facility, such as roads. As noted in the 2022 ASC, some displacement of raptors and functional loss of foraging habitat are expected to result from the Project (Horse Heaven Wind Farm, LLC 2022). To quantify the indirect impacts of the Project, a ZOI was developed for the Project. A distance of 0.5 miles (800 meters) from Project infrastructure was selected as the ZOI. This distance was selected based on:

- Literature suggesting that mean abundance of birds declines within 0.5 miles (800 meters) of infrastructure (Benítez-López et al. 2010)
- Literature published on the displacement distances from wind farms, discussed above

- Application of conservative assumptions to account for uncertainty in the literature

With the application of the 0.5-mile ZOI, the Project is predicted to result in the disturbance (indirect loss) of an additional 53,127 acres of habitat, the majority (74 percent) is agricultural land. A summary of estimated indirect loss, calculated by habitat type, is provided in **Table 4.6-5** and shown in **Figure 4.6-1**. The calculation of indirect loss was estimated using Turbine Option 1 because this option is expected to involve a greater spatial distribution of turbines than Option 2.

Table 4.6-5: Summary of Estimated Indirect Habitat Loss in the Lease Boundary

Habitat Type	Acres	Percentage of Total Indirect Loss
Agriculture Land	39,169	74%
Developed/Disturbed	699	1.3%
Eastside (Interior) Grassland[(a)]	85	<1%
Grassland	4,576	8.6%
Non-native Grassland	1,462	2.8%
Planted Grassland	3,246	6.1%
Dwarf Shrub-steppe[(a)]	13	<1%
Rabbitbrush Shrubland	1,678	3.2%
Sagebrush Shrub-steppe[(a)]	1,019	1.9%
Shrubland	1,181	2.2%
Total	**53,128**	

Notes: Calculations of areas were completed independently using spatial files provided by the Applicant.
(a) Washington State Department of Fish and Wildlife Priority Habitats

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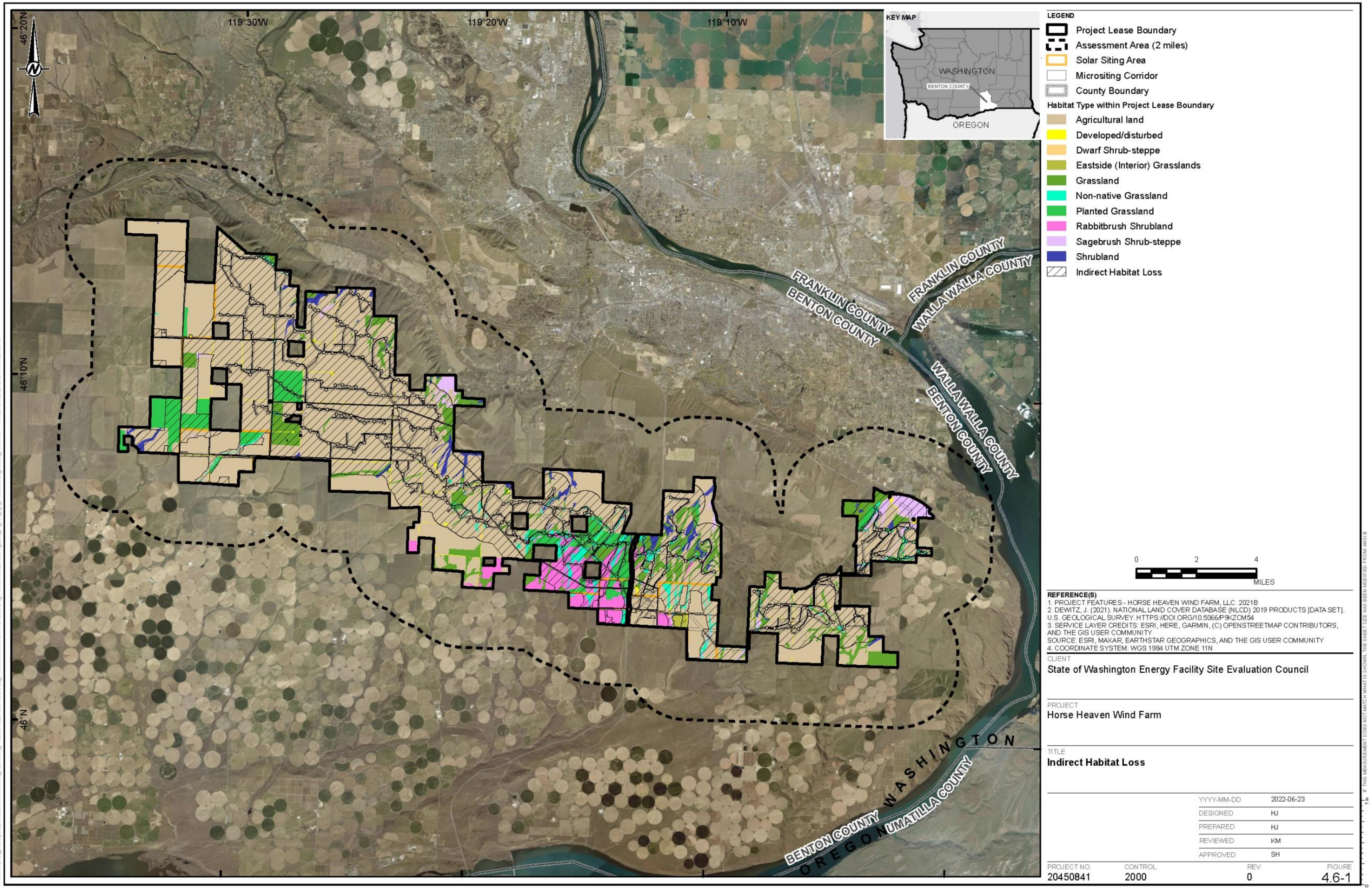

Figure 4.6-1: Indirect Habitat Loss

Operation of the comprehensive Project would result in the direct loss of habitat. Direct loss of habitat associated with the Wind Energy Micrositing Corridor, solar arrays, BESS, substations, and associated transportation routes initiated during construction would continue throughout Project operation. The Project may result in indirect habitat loss through degradation of habitat in the ZOI created by disturbances (e.g., noise, light) from Project infrastructure.

Operation of the comprehensive Project is predicted to have a medium impact on habitat loss that is constant, unavoidable, and local to within 0.5 miles of Project components.

Wildlife Mortality from Operation of Comprehensive Project

Operation of the Project presents several sources of potential wildlife mortality, such as collisions with infrastructure, change in prey structure, and ingestion of toxic materials. Potential impacts on wildlife from collision with turbines and solar arrays are analyzed in the sections below.

In addition to collisions with turbines and solar arrays, fatalities could also occur from strikes with power lines, windows, weather towers, and vehicles. Collision frequency with these infrastructure components is challenging to predict because site-specific factors, such as siting of infrastructure and local species composition, influence the frequency of mortality. It is estimated that between 12 million and 64 million birds are killed annually in the United States due to interactions with power lines (Loss et al. 2014). D'Amico et al. (2019) suggest that large, longer-living species with a low reproductive rate (e.g., raptors) tend to be at greater risk of collision with power lines. Further, behavioral traits, such as flight height within the range of power lines, increase the risk of collisions. It is expected that some mortality would occur due to collisions with overhead power lines, weather towers, and other infrastructure. This effect is expected to be more pronounced for larger birds, such as raptors.

Wildlife may also be killed on access roads developed for the Project. Access roads, arterial roads, and highways can be a substantial source of mortality, particularly for smaller wildlife such as herptiles and rodents. Wildlife can be attracted to roads as the granular base provides a unique habitat (e.g., road edge used for burrowing, and road surface used for thermoregulation). However, the Applicant does not predict that Project operations would require substantial road traffic. Therefore, road-based mortality is not predicted to be a substantial source of wildlife mortality, given the Applicant commitments discussed in Section 4.6.2.5.

The Applicant does not predict mortalities from interactions with hazardous or toxic materials because these materials would be stored and handled according to applicable environmental laws (Horse Heaven Wind Farm, LLC 2022). Therefore, interactions with these substances would be limited to unexpected events such as accidents and malfunctions.

Changes and alterations due to human activity can influence predator-prey structure, as well as inter-species composition. Increased activity and infrastructure can deter larger predators from the landscape by creating a prey "refuge" (Muhly et al. 2011). Anthropogenic changes can also result in increased abundance of human-tolerant species, such as corvids, which are able to out-compete or prey on wildlife that existed prior to development. These changes may lead to lower survivorship of predators and their offspring, resulting in increased mortality.

The Project may result in mortality of aerial species (birds and bats) through collisions with turbines, power lines, solar arrays, windows, and weather towers. Other sources of mortality on wildlife, including non-aerial species, include vehicle collisions and changes in food availability. Operation of the comprehensive Project is predicted to have a medium impact on wildlife mortality that is long term, probable, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Operation of Comprehensive Project

Barriers to Movement

Barriers to movement have been widely discussed in literature (Bromley 1985; Berger 1995; Jalkotzy et al. 1997). Barriers to movement occur when infrastructure bisects a movement corridor or habitat, reducing or prohibiting wildlife movement between habitat patches. These barriers can be physical constraints, such as fencing, but also include perceived barriers, such as forest openings, roads, and power lines. While linked to habitat fragmentation, barriers to movement can occur in already fractured landscapes where wildlife persists. Infrastructure associated with wind turbines could create barriers to wildlife movement (Román et al. 2020).

The Washington Wildlife Habitat Connectivity Working Group has modeled movement corridor linkages to facilitate landscape level habitat management. These linkages were developed based on a composite of focal species habitat mapping (WHCWG 2012). Generally, the Project would be situated in areas classified with low and medium linkage ratings; polygons classified with high movement corridor class rating occur north and south of the Wind Energy Micrositing Corridor and within the Lease Boundary (Figure 3.6-2). Further, much of the Horse Heaven Hills ridgeline is considered a “pinch-point” for wildlife movement (rated as very high) (WHCWG 2013). A pinch-point is defined as a “portion of the landscape where movement is funneled through a narrow area. Pinch points can make linkages vulnerable to further habitat loss because the loss of a small area can sever the linkage entirely” (WHCWG 2012).

The Applicant reports that Project turbines would be located away from the escarpment that runs east-west along the northern perimeter of the Lease Boundary. The Project bisects some areas rated as high linkage along the Horse Heaven Hills ridgeline and one to the south, adjacent to Highway 395. The Applicant notes that the Project has been designed to avoid impacts to movement corridors by siting turbines and associated roads such that approximately 11 turbines may be located in a high linkage area (Horse Heaven Wind Farm, LLC 2022). As discussed above, wildlife may avoid infrastructure that bisects these linkages, which would restrict their movement. It is noted that these linkages were created based on modeled habitat, and empirical data assessing wildlife usage were not used to verify movement corridors. Based on the overlap with modeled movement corridors, the Project may impact wildlife movement over the local landscape, particularly the north-south corridor west of Highway 395, which would be bisected by the Project.

The Applicant notes that the Project would be located along the Pacific Flyway, and migrating birds, including waterfowl, shorebirds, and waterbirds, may move over the Lease Boundary to access stopover sites in adjacent areas (e.g., Columbia River). Based on avian field data collected by the Applicant, the Lease Boundary is not expected to provide unique stopover habitat, such as wetlands or riparian areas, although migrating birds could forage in croplands, shrublands, and grassland during migrations. The Lease Boundary is it located along concentrated migration routes (Horse Heaven Wind Farm, LLC 2022).

New access roads may result in barriers to movement for smaller wildlife species, such as mice, voles, and herptiles (e.g., MacPherson et al. 2011; Paterson et al. 2019; Shepard et al. 2008), though the magnitude of the resulting impact varies based on road type and habitat (Kroeger et al. 2021; Forman et al. 2002). The Applicant proposes to construct up to 105 miles of new access roads. Roads are expected to be 16 feet wide. The proposed access roads are not expected to be heavily used, which is predicted to reduce the potential for creating barriers to movement. However, new access roads, particularly through native habitats, such as grasslands and shrublands, may reduce movement of small animals over these landscapes.

Power line corridors are another linear feature of the Project that could create barriers to movement. The behavioral reaction of wildlife to power lines may not be the same as the reaction to roads because vegetation and natural ground conditions may be maintained under the power lines. As noted by Richardson et al. (2017), the available literature on the impacts of power lines in non-forested ecosystems is limited. As discussed above, infrastructure can change the landscape for wildlife, possibly changing predator-prey relationships. Transmission towers and distribution poles provide new perching structures for birds (Morelli et al. 2014), a feature that can be limiting in shrub and grassland ecosystems. The availability of these new perching features like power lines and utility poles is postulated to increase predation pressure from raptors and corvids (Richardson et al. 2017), resulting in avoidance of power line corridors by some prey species such as herptiles, small mammals, and birds (Pruett et al. 2009). Behavioral change of large mammals in response to power line corridors can vary, with some species attracted to linear features as a source of forage or movement, while others avoid these features (e.g. Bartzke et al. 2014, Bartzke et al. 2015). Leu et al. (2011) did not observe avoidance of power line corridors by pronghorn antelope.

Habitat Fragmentation

Anthropogenic changes to the landscape, such as removal of native vegetation, creation of linear features, and development of infrastructure, can fragment ecosystems, resulting in a patchwork of smaller native vegetation communities dispersed among altered habitats. Habitat fragmentation is linked to barriers to movement. The Project would generally be situated on a landscape that has been fragmented by agriculture, urban development, and roads. The Project is predicted to result in new fragmentation where Project components bisect native shrub-steppe habitat, predominantly along the northern boundary of the Lease Boundary. Further fragmentation may occur where roads and other ground disturbance is proposed over canyons and draws.

The operation of turbines, solar arrays, power lines, roadways, and other infrastructure could result in barriers to wildlife movement and fragmented habitat. Barriers and fragmentation created during construction would predominantly remain through operation. Operation of the comprehensive Project operation is predicted to have a medium impact on barriers to wildlife movement and habitat fragmentation that is long term, probable, and confined to the Lease Boundary.

4.6.2.3 Impacts during Decommissioning

Impacts associated with decommissioning would be similar to impacts identified during Project construction (Section 4.6.2.1). General potential impacts from decommissioning are described below and characterized by Project components in subsequent sections.

Turbine Option 1 and Turbine Option 2

Habitat Loss from Decommissioning of Turbines

The Project would result in temporary loss of habitat during decommissioning of Turbine Option 1 and Turbine Option 2. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation. Decommissioning under Turbine Option 1 and Turbine Option 2 is predicted to have a negligible impact on habitat loss that is short term, unavoidable, and local to within 0.4 miles of decommissioning areas.

Wildlife Mortality from Decommissioning of Turbines

Sources of wildlife injuries and mortalities during decommissioning include collisions with equipment; removal of nuisance wildlife; destruction of nests, dens, and burrows; and habitat loss. The risk of mortalities would be limited to the duration of decommissioning. Turbine decommissioning under Turbine Option 1 and Turbine Option 2 is predicted to have a negligible impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Decommissioning of Turbines

Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas. Decommissioning of turbines is predicted to have a negligible impact on barriers to wildlife movement and habitat fragmentation that is short term, feasible, and confined to the Lease Boundary.

Solar Arrays

Habitat Loss from Decommissioning of Solar Arrays

The Project would result in temporary loss of habitat during decommissioning of solar arrays. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation. Solar array decommissioning is predicted have a negligible impact related to habitat loss that is short term, unavoidable, and confined to the solar array fields, access roads, and ancillary facilities.

Wildlife Mortality from Decommissioning of Solar Arrays

Sources of wildlife injuries and mortalities during decommissioning include collisions with equipment; removal of nuisance wildlife; destruction of nests, dens, and burrows; and habitat loss. The risk of mortalities would be limited to the duration of decommissioning. Decommissioning of the solar arrays is predicted to have a negligible impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Decommissioning of Solar Arrays

Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas. Decommissioning of the solar arrays is predicted to have a negligible impact resulting in barriers to wildlife movement and habitat fragmentation that is short term, feasible, and confined to the Lease Boundary.

Battery Energy Storage Systems

Habitat Loss from Decommissioning of BESS

The Project would result in temporary loss of habitat during decommissioning of BESS. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation. Decommissioning of the BESS is predicted to have a negligible impact resulting in habitat loss that is short term, unavoidable, and limited to the BESS areas.

Wildlife Mortality from Decommissioning of BESS

Sources of wildlife injuries and mortalities during decommissioning include collisions with equipment; removal of nuisance wildlife; destruction of nests, dens, and burrows; and habitat loss. The risk of mortalities would be limited to the duration of decommissioning. Decommissioning of the BESS is predicted to have a negligible impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Decommissioning of BESS

Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas. Decommissioning of the BESS is predicted to have a negligible impact resulting in barriers to wildlife to movement and habitat fragmentation that is short term, feasible, and limited to the BESS areas.

Substations

Habitat Loss from Decommissioning of Substations

The Project would result in temporary loss of habitat during decommissioning of substations. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation. Decommissioning of the substations is predicted to have a negligible impact resulting in habitat loss that is short term, unavoidable, and limited to the substation areas.

Wildlife Mortality from Decommissioning of Substations

Sources of wildlife injuries and mortalities during decommissioning include collisions with equipment; removal of nuisance wildlife; destruction of nests, dens, and burrows; and habitat loss. The risk of mortalities would be limited to the duration of decommissioning. Decommissioning of the substations is predicted to have a negligible impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Decommissioning of Substations

Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas. Decommissioning of the substations is predicted to have a negligible impact related to barriers to wildlife movement and habitat fragmentation that is short term, feasible, and limited to the substation areas.

Comprehensive Project

Habitat Loss from Decommissioning of Comprehensive Project

Some temporary disturbance of habitat is expected to be required during Project decommissioning to facilitate removal of the infrastructure. These losses are described in Section 4.5.2.3. No new permanent habitat loss is expected during the Decommissioning Stage. The duration of temporary habitat loss would be limited to the timeframe during which the decommissioning and restoration activities would occur.

Revegetation of areas associated with temporary, modified, and permanent disturbance would be conducted during the Decommissioning Stage. Revegetation of areas of shrub-steppe habitat lost during construction and operation would have a positive effect on wildlife from operational conditions, and revegetation could have a positive impact on wildlife by re-establishing native habitat types and habitat connectivity in areas previously dominated by agriculture.

Noise and disturbance associated with decommissioning activities are also expected to be similar to impacts described for the Construction Stage. Wildlife are expected to be temporarily displaced due to increased visual and noise disturbances during infrastructure removal. These impacts are predicted to be short term and would end once decommissioning activities are complete.

Removal of infrastructure could change available habitat for species that had adapted to site conditions associated with Project features. For example, removal of transmission poles may result in a reduction of perching and nesting habitat for guilds, such as raptors, that have adapted to using these features. Similarly, if smaller mammals have adapted to using solar arrays as shelter, removing these features may reduce shelter sites for smaller animals.

The Project would result in temporary loss of habitat during decommissioning of the comprehensive Project. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation. Decommissioning of the comprehensive Project is predicted to have a negligible impact resulting in habitat loss that is short term, unavoidable, and local to within 0.4 miles of decommissioning areas.

Wildlife Mortality from Decommissioning of Comprehensive Project

Sources of wildlife injuries and mortality during decommissioning are expected to be similar to Construction-Stage activities, including collisions with equipment, removal of nuisance wildlife, destruction or failure of nests, destruction of dens and burrows, and habitat loss. The risk of mortality would be limited to the duration of decommissioning.

Sources of wildlife injuries and mortalities during decommissioning include collisions with equipment; removal of nuisance wildlife; destruction of nests, dens, and burrows; and habitat loss. The risk of mortalities would be limited to the duration of decommissioning. Decommissioning of the comprehensive Project is predicted to have a negligible impact on wildlife mortality that is short term, feasible, and confined to the Lease Boundary.

Barriers to Movement and Habitat Fragmentation from Decommissioning of Comprehensive Project

Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas. Decommissioning of the comprehensive Project is predicted to have a negligible impact resulting in barriers to wildlife movement and habitat fragmentation that is short term, feasible, and confined to the Lease Boundary.

4.6.2.4 Special Status Species

This section describes the predicted impacts on special status species from the construction, operation, and decommissioning of the Micrositing Corridor, solar arrays, BESS, substations, and other supporting infrastructure. The predicted impacts from the comprehensive Project from the three stages are described collectively under the species-specific heading. The Lease Boundary may support 20 special status species. Special status species may be less resilient to habitat loss, habitat change, or changes in population due to the existing pressures on the populations in the baseline case. The following sections describe the potential Project-related impacts on special status wildlife species that may have deviated from the descriptions of impacts provided in the preceding sections. Individual impact ratings for special status species have been provided in the impact summary tables, **Table 4.6-11a** through **Table 4.6-11c**. Pronghorn antelope is also included in this section. While not considered a special status species, pronghorn antelopes are understood to be of special importance to the Yakama Nation and are the subject of a regional re-introduction program.

Sagebrush Lizard and Striped Whipsnake

As noted by the Applicant, while sagebrush lizards (*Scleoporus graciuosus*) have not been recorded within the Lease Boundary, suitable habitat for the species is available in the area (Horse Heaven Wind Farm, LLC 2022). Striped whipsnake (*Coluber taeniatus*) has also not been documented in the Lease Boundary, and the Applicant reports that suitable hibernacula are not available in this location; however, Gap Analysis Project (GAP) data classify portions of the Lease Boundary as year-round habitat. Shrub-steppe, rabbitbrush, and grassland may be impacted by the Project, resulting in a loss of potentially suitable sagebrush lizard and striped whipsnake habitat (**Table 4.6-6**). Agricultural areas that would be modified under the solar facility could be used as thermoregulatory or shelter sites by reptiles; however, the response of reptiles to these facilities is unknown.

Table 4.6-6: Potential Loss of Sagebrush Lizard and Striped Whipsnake Habitat

Habitat Type	Temporary Disturbance (acres)	Permanent Disturbance (acres)	Modified Habitat (acres)
Eastside (Interior) Grassland	17	5	72.5
Non-native Grassland	137	13	24.7
Planted Grassland	263	33	215.3
Dwarf Shrub-steppe	9	1	0
Rabbitbrush Shrubland	154	49	706.1
Sagebrush Shrub-steppe	31.1	1	0.3

Source: Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021
Notes: Calculations of areas were completed independently using spatial files provided by the Applicant.

There is a lack of data on behavioral changes in reptiles due to wind farms. Potential effects on sagebrush lizard and striped whipsnake are extrapolated from studies on other reptiles, where information exists. In a study on changes in side-blotched lizard (*Uta stansburiana*) populations in response to wind farms in California, Keehn et al. (2019) concluded that wind farms did not notably influence species demography or behavior. However, this study did find that the species avoided areas of dense roads. Similarly, sagebrush lizard and striped whipsnake may not avoid habitat around turbines but could avoid new access roads developed for the Project. Reptiles could be attracted to solar arrays, as these areas could provide shelter from predation by raptors. Further, it is possible that solar arrays may provide areas of thermoregulation.

Reptiles are vulnerable to road-based mortality (Row et al. 2007). Increased road networks in the Lease Boundary can increase the risk of mortality for sagebrush lizard and striped whipsnake; however, operational traffic levels are expected to be minimal. Therefore, a substantially increased risk to sagebrush lizard and striped whipsnake is not expected.

Impacts from Project construction (Turbine Options 1 and 2, solar arrays, BESS, substations, and the comprehensive Project) are predicted to have a low impact on sagebrush lizard and striped whipsnake that is constant, feasible, and confined within 0.5 miles of infrastructure. Impacts initiated in construction would predominantly persist through operation and are predicted to be low magnitude, constant, and may feasibly occur confined within 0.5 miles of infrastructure. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

American White Pelican

The Applicant reports that the Lease Boundary does not provide suitable foraging or resting habitat for the American white pelican, though a resident population occurs within 4 miles of the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). Suitable habitat is mapped to the north and east of the Lease Boundary, along the Columbia River (Horse Heaven Wind Farm, LLC 2021c). The Project is not expected to result in direct or indirect loss of American white pelican habitat.

American white pelicans were observed during field surveys flying over the Lease Boundary near the Columbia River. The Applicant reported that American white pelicans are predicted to be the fifth most likely bird to collide with Project infrastructure. However, prior to the submittal of the ASC in 2021, the Applicant removed the most eastern portion of the proposed Project, which is expected to reduce the potential for American white pelicans to strike turbines. Further, the Applicant reports that no mortalities of this species have been recorded at the nearby

Nine Canyon Wind Project. Exposure indices for American white pelican are similar for all turbine technologies, ranging from 0.289 for Option 1 technologies to 0.303 for Option 2 technologies. Given that Option 1 would require more turbines than Option 2, it is predicted to result in a greater collision risk for American white pelicans.

Water-associated birds are susceptible to mortality at solar facilities. These species may misperceive solar arrays as waterbodies and attempt to land on them (i.e., the lake effect), resulting in injury and mortality.

Water-associated birds have been reported to avoid wind farms potentially being displaced over 0.3 miles (600 meters) (Larsen and Madsen 2000; Rees 2012). With the removal of the eastern portion of the Project prior to submission of the ASC, turbines are not expected to be situated within 0.3 miles of suitable American white pelican habitat; therefore, potential barriers to American white pelican are predicted to be limited.

Project construction (Turbine Options 1 and 2, solar arrays, BESS, substations, and the comprehensive Project) is predicted to have a negligible impact on the American pelican that is short term, unlikely to occur, and limited in extent. During operation of the turbines (Options 1 and 2), solar arrays, and comprehensive Project impacts on the American pelican are predicted to be medium magnitude, long term, unlikely to occur, and confined. Operation of the BESS and substations is not predicted to interact with American white pelicans, resulting in a negligible magnitude. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, unlikely to occur, and confined.

Bald Eagle

The Applicant reported seven bald eagle (*Haliaeetus leucocephalus*) territories within 10 miles of the Lease Boundary, all but one of which were active during at least one survey round. Nest sites were approximately 3.7 to 10.7 miles from the location of the proposed turbines. Although territories were recorded near the Project location, the Applicant notes that bald eagle occurrence within the Lease Boundary is low and that there is little suitable habitat for this species, such as suitable foraging waterbodies and nesting trees. Based on the lack of nesting observed within the Lease Boundary and the limited observations of bald eagles during surveys, it is expected that the Project would not remove important or unique bald eagle habitat. Further, Project turbines would be located over 3.7 miles from the closest nest, and the ZOI applied to the Project is not predicted to overlap with known bald eagle nest sites.

The Applicant estimates that bald eagles are the 17th most likely large bird species to collide with the Project turbines, with an estimated exposure index of 0.01. The Applicant also reports that no bald eagle fatalities have been reported at the nearby Nine Canyon Wind Power Project (Horse Heaven Wind Farm, LLC 2022). Bald eagles are expected to continue to fly over the Project during operation and would be exposed to a risk of collisions (Horse Heaven Wind Farm, LLC 2022). The exposure index for bald eagles is approximately 1.1 to 1.3 times greater for Option 2 technologies than Option 1 technologies. There is uncertainty regarding whether the increased risk exposure for Option 2 would be offset by the increased number of turbines proposed in Option 1. Other sources of mortality could include collisions with other infrastructure and vehicles. Bald eagles could collide with solar arrays if birds are foraging around the facility, though there is limited information on interactions between solar facilities and raptors. Bald eagle populations have increased over the past 30 years, and the species has been removed from the federal endangered species list and downgraded in Washington State from threatened to sensitive. Short-term population trends are generally considered stable to increasing (Hammerson and Cannings 2022). Given that the population is stable to increasing, bald eagles are considered resilient to minor pressures on population, such as infrequent mortality.

The Project could create a temporary barrier to bald eagle movement during construction and onset of operation because these stages would introduce new disturbances to the landscape. Bald eagles are tolerant of human activity and typically coexist with human development (Hammerson and Cannings 2022) and are expected to adapt to Project operations. Further, based on data provided in the ASC, the Project would not bisect bald eagle nesting and foraging habitat.

Project construction (Turbine Options 1 and 2, solar arrays, BESS, substations, and the comprehensive Project) are predicted to have a negligible impact on bald eagle that is short term and feasible within the Lease Boundary (confined). During operation Project-related impacts on bald eagle from Turbine Option 1 and 2 and the comprehensive Project are predicted to be low magnitude, long term and feasible in the Lease Boundary (confined). Operation of the solar arrays, BESS and substations are predicted to have a negligible effect to bald eagle that is long term, feasible, and limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Burrowing Owl

Predictive mapping provided by the Applicant in response to data requests (Horse Heaven Wind Farm, LLC 2021c) characterizes the Lease Boundary as either summer or year-round burrowing owl (*Athene cunicularia*) habitat. The Applicant notes that the Lease Boundary provides suitable foraging and nesting habitat for burrowing owl (Horse Heaven Wind Farm, LLC 2022). Priority Habitats and Species (PHS) data report 32 burrowing owl nests or burrows within 2 miles of the Lease Boundary, including four within the Lease Boundary (WDFW n.d.). The Applicant notes that removal of shrub-steppe habitat could reduce foraging and nesting habitat (Horse Heaven Wind Farm, LLC 2022), though burrowing owls can use marginal habitat, such as roadside and agricultural fields. It is predicted that the Project would result in the permanent loss of approximately 51 acres of shrub and 51 acres of grassland habitat. While agricultural habitat is less suitable for burrowing owls, the predicted loss of 489 acres of agricultural habitat associated with the Project is considered to be a reduction in moderate to low suitable habitat. Temporarily disturbed habitat is expected to be restored following construction, and therefore the temporary loss of 194 acres of shrub and 417 acres of grassland may impact burrowing owls during the Construction and early Operation Stages. Modified habitat under solar facilities may continue to provide burrowing owls with habitat, particularly in agricultural areas where post-construction remediation may improve plant diversity.

In addition to loss of habitat, construction of the Project could damage occupied and suitable unoccupied burrows, reducing the availability of these features on the landscape. Degradation of breeding and wintering habitat, including loss of suitable burrow sites is considered a threat to the species (Poulin et al. 2020).

The Project is not predicted to overlap with the 15 breeding locations reported within 2 miles of the Lease Boundary. The Applicant reports that noise from the Project could disturb burrowing owls nesting in these locations because they are within 0.5 miles of the Project. Species-specific surveys for burrowing owls were not conducted as part of the ASC; therefore, it is possible that other burrows may exist within the Lease Boundary. Burrowing owls are generally tolerant of human activity; however, reduced reproductive success has been recorded near construction activities (Poulin et al. 2020). The potential reduction in habitat suitability due to Project-related disturbance has been addressed under “Indirect Habitat Loss,” above.

Burrowing owls typically stay low to the ground during hunting and movement (below 33 feet [10 meters]) (Poulin et al. 2020). This behavior (remaining close to the ground) reduces the potential for interaction with turbine rotor swept area, which is approximately 85 feet (26 meters) above the ground. However, during courtship burrowing owls conduct courtship flights at heights of 100 to 130 feet (30 to 40 meters; Poulin et al. 2020), which extends into the rotor swept area. Burrowing owl may also be suspectable to collisions with turbines during migration.

Substantial burrowing owl mortality was recorded at the Altamont Pass Wind Resource Area (California), with estimates of over 100 burrowing owl mortalities per year (Smallwood et al. 2007). However, the turbines in the Altamont Pass Wind Resource Area were generally older-generation, smaller turbines with hub (nacelle) heights approximately 60 feet (18 meters) to 115 feet (35 meters), whereas the Applicant expects Project turbines to be taller (266 feet [89 meters] to 518 feet [125 meters]). Repowering portions of the turbines in the Altamont Pass Wind Resource Area by replacing older turbines with taller towers reportedly reduced burrowing owl mortality by 34 to 100 percent (Smallwood et al. 2009); therefore, the Project's turbines may not pose the same risk to burrowing owls as those at the Altamont Pass Wind Resource Area.

The rate of burrowing owl fatalities is correlated with the species' use of an area. Smallwood et al. (2010) reported a positive relationship between burrowing owl fatalities and the number of burrows within 180 feet (55 meters) of wind turbines. No burrowing owl burrows have been recorded in the Lease Boundary, suggesting reduced potential risk of burrowing owl mortality from turbine collision. Burrowing owls typically stay low to the ground during hunting and movement (Poulin et al. 2020). The solar arrays would be within the flight height of burrowing owls and therefore pose a risk of collision-related mortality. Walston et al. (2015) reported seven burrowing owl mortalities between 2011 and 2014 at three of seven solar facilities in California, representing 0.51 percent of all recorded wildlife mortalities observed at those sites during that period. Smallwood (2022) estimated a mortality rate of 0.182 collision fatalities/MW/year for solar photovoltaic projects in California. No burrowing owls have been reported in the Lease Boundary; however, the solar arrays may increase the risk of burrowing owl mortalities from collisions if burrowing owls are present.[33]

Strikes with burrowing owls resulting in mortalities could occur during construction and along access roads during construction and operation. Burrowing owls would be susceptible to construction-related mortality around burrows as machinery could crush adults, young, or eggs in burrow sites. New access roads would introduce new sources of mortality, though Project-related traffic through the Operation Stage is expected to be limited.

The Project is not expected to require the use of pesticides or rodenticides, which could lead to ingestion of toxic materials. Changes in prey distribution or density due to Project construction and operation could impact burrowing owl survivorship and recruitment.

New access roads created for the Project would bisect suitable burrowing owl habitat, potentially creating new barriers to movement and further fragmenting burrowing owl habitat.

Long and short term North American population trends for burrowing owls are predicted to show declines around 30 percent, although the Washington State populations are relatively low, with declines of approximately 1.5 percent annually between 1968 and 2005 (Hammerson and Cannings 2022; Poulin et al. 2020; WDFW 2022). Based on these trends and the species' potential tolerance to some human disturbance, the population is not predicted to be resilient to habitat and population pressures.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a medium impact on burrowing owls that is constant for burrowing owl habitat loss but short term for burrowing owl mortality and disturbance. Habitat loss during construction is assessed as

[33] The Applicant did not conduct species-specific burrowing owl surveys within the Lease Boundary prior to issuing this EIS.

unavoidable, while disturbance to burrowing owls is probable and mortality is feasible. Impacts are considered confined to the Lease Boundary.

Operation of turbines and the comprehensive Project is predicted to have a medium-magnitude, constant impact on burrowing owls that are unavoidable and confined to the Project Lease Boundary. Impacts from operation of the solar arrays, BESS, and substations are predicted to be medium magnitude, constant, feasible, and confined to the Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, unlikely, and confined.

Ferruginous Hawk

Ferruginous hawks (*Buteo regalis*) have been documented foraging and nesting within and near the Lease Boundary. Fifty-eight ferruginous hawk nests were documented within 2 miles of the proposed turbine locations (56 from PHS data, 2 recorded by the Applicant), two of which were occupied at least once over the four-year period during which the Applicant conducted surveys (Horse Heaven Wind Farm, LLC 2022). PHS data document 56 ferruginous hawk nests within 2 miles of the Lease Boundary, including 10 within the Lease Boundary (WDFW n.d.). One of the active nests was recorded approximately 0.5 miles from an area of temporary disturbance associated with construction of a turbine pad. Ferruginous hawks were recorded infrequently in the Lease Boundary. It is expected that ferruginous hawks nesting near the Project may forage in the Lease Boundary. Project-related losses of shrub, grassland, and agricultural habitat that could support small mammal populations are considered a reduction in potential foraging habitat for the ferruginous hawk. Direct habitat loss estimates are provided in **Table 4.6-7** and are estimated based on the ferruginous hawk's 2-mile core habitat and the 6-mile range habitat (areas measured as a radius around the two active nests). Direct habitat loss within 2 miles (measured as a radius from the nest) of historical nest locations may reduce the capacity for these areas to be reoccupied in the future. Loss and degradation of ferruginous hawk habitat leading to fewer breeding locations, and loss of habitat that supports prey items, both affect the persistence of the species in Washington State (Hayes and Watson 2021).

Table 4.6-7: Potential Direct Loss of Ferruginous Hawk Habitat

Habitat Type	Core Habitat (acres)	Range Habitat (acres)
Agriculture	260	6,271.6
Developed/Disturbed	0.6	21.1
Dwarf Shrub-steppe	0	10.0
Eastside (Interior) grassland	8.3	80.4
Grassland	0.1	<0.1
Non-native Grassland	10.5	121.7
Planted Grassland	54.5	423.9
Rabbitbrush Shrubland	20.8	854.5
Sagebrush Shrub-steppe	5.3	17.0
Shrubland	0	<0.1

Source: Horse Heaven Wind Farm, LLC 2022; Tetra Tech 2021
Notes: Calculations of areas were completed independently using spatial files provided by the Applicant.

Estimating Project-related indirect loss of ferruginous hawk habitat is challenging because this species displays some tolerance of wind power projects in the short term (Watson et al. 2018); however, long-term monitoring of continued territory occupancy is not well studied. Watson et al. (2018) note that while breeding pairs currently occupying territories near wind farms may continue to occupy those territories, this behavior may not reflect future recruitment of birds into territories near wind farms. This is consistent with the results of a study conducted in the Columbia Plateau Ecoregion that reported a decline in ferruginous hawk nest success with increased wind turbines in the bird's home range buffer (7,907 acres) (Kolar and Bechard 2016). The Applicant notes that the Project could result in a reduction of ferruginous hawk territory occupancy and nesting success, as well as modification of foraging habitat (Horse Heaven Wind Farm, LLC 2022). These changes could result in the species' abandonment of the territory in and adjacent to the Project in the long term. **Table 4.6-8** provides a summary of available habitat within the ferruginous hawk core habitat and range habitat that may be indirectly impacted by the Project. Refinement of potential indirect loss estimates would require additional data regarding the foraging patterns specific to the pair currently occupying the territory in the Lease Boundary.

Table 4.6-8: Potential Indirect Loss of Ferruginous Hawk Habitat

Habitat Type	Core Habitat (acres)	Range Habitat (acres)
Agriculture	3905.9	32,051.8
Developed/Disturbed	21.6	587.6
Dwarf Shrub-steppe	0	13.3
Eastside (Interior) Grassland	8.3	76.5
Grassland	458.1	3736.3
Non-native Grassland	165.3	1179.4
Planted Grassland	515.2	2586.8
Rabbitbrush Shrubland	107.1	1563.4
Sagebrush Shrub-steppe	84.8	259.6
Shrubland	273.4	796.2

Source: Horse Heaven Wind Farm, LLC 2021a;
Notes: Calculations of areas were completed independently using spatial files provided by the Applicant.

Ferruginous hawks may become tolerant of wind farms constructed within their territories and have been reported to continue to forage between turbines during operation (Watson et al. 2018). This behavior may increase the risk of collision with turbines as they move between the structures. The Applicant notes that eight wind-farm-related ferruginous hawk fatalities have been recorded in the Pacific Region, though no ferruginous hawk fatalities have been reported at the nearby Nine Canyon Wind Project (Horse Heaven Wind Farm, LLC 2022) and has estimated ferruginous hawks to have an exposure index of <0.1, ranking them as the 24th most likely species to collide with the turbines. While the exposure index calculated for this species is low, Hayes and Watson (2021) report that the local (Benton and Franklin Counties) and state-wide populations are in substantial decline.

The exposure index for ferruginous hawks is approximately 1.3 times greater for Turbine Option 1 (GE 3.03-MW) than for the other three turbine technologies (GAL 2022; **Appendix 4.6-1**). In addition, Option 1 also requires a larger number of turbines, and therefore, it is expected that this option would result in a greater collision risk for ferruginous hawks (GAL 2022).

Changes in prey and bird community structures may also impact ferruginous hawks. Changes in density of prey (e.g., ground squirrel, rabbit) due to the Project could impact survivorship of adults and young. Prey density could be altered by Project-related habitat loss, barriers to movement, and changes in available shelter sites under solar arrays that could reduce hunting success. In addition, development of wind farms can change the composition of bird communities (Falavigna et al. 2020), potentially resulting in an increase in other raptor or corvid species that compete with ferruginous hawk for resources. For example, Kolar and Bechard (2016) noted that turbines changed the nesting success of ferruginous hawk but found no changes to the nesting success of more common

Buteo species (red-tailed hawk [*Buteo jamaicensis*] and Swainson's hawk [*Buteo swainsoni*]). Similarly, corvid populations may also have a positive response to the Project as it can create more nesting and perching opportunities on the transmission structures and power poles. These species may compete with the ferruginous hawk for resources potentially impacting nesting success and adult survivorship.

Ferruginous hawks may also collide with other facility infrastructure such as powerlines and weather towers. Ferruginous hawks could collide with solar arrays if they are foraging around the facility, though there is limited information on interactions between solar facilities and raptors.

The Project is not predicted to require the use of pesticides or rodenticides, which could further impact prey populations or bioaccumulate in hawks through prey consumption.

The ferruginous hawk population is declining in the baseline case due to mortality and habitat loss. Decreased breeding activity and nest productivity (i.e., the number of fledged young per occupied territory) have been documented across Washington State, including in core range in Benton County (Hayes and Watson 2021). Based on documented declines, the local population may not be resilient to loss of individuals and habitat, meaning that the population may not be able to adapt or recover from additional loss of habitat or individuals. Unlike other hawk species that occupy grassland habitats (e.g. Swainson's hawk), ferruginous hawk are a grassland specialist and show poor adaptability to changing landscape conditions, such as conversion to agriculture (COSEWIC 2008). Hayes and Watson (2021) identify four dominate causes of ferruginous hawk decline in Washington State: Habitat loss/ degradation/ fragmentation, reduction of prey base, collisions with wind turbines, and climate change. The Project is expected to contribute to three of these threats (habitat loss/degradation, loss of prey base, collisions with wind turbines). Development within suitable ferruginous hawk habitat, including territories not currently occupied, may impact the recovery of the species by limiting habitat availability for recruitment of new nesting pairs. While the Project may contribute to three of the threats to ferruginous hawk, it is also expected to contribute to the production of renewable energy thereby reducing regional contribution to climate change.

Construction of Turbine Options 1 and 2, BESS, substations, and comprehensive Project is predicted to have a high-magnitude impact on ferruginous hawks that is constant and unavoidable for habitat loss, and short term and probable for disturbance. These construction impacts are predicted to be confined to the Project Lease Boundary. Construction of the solar arrays is predicted to have a medium-magnitude, constant, unavoidable impact on ferruginous hawks that is limited in extent. Operation of the turbines (Options 1 and 2) and comprehensive Project is predicted to result in a high-magnitude, constant impact that is unavoidable within the Project Lease Boundary (confined). Operation of the solar arrays is predicted to have a medium-magnitude, constant impact that is unavoidable within the Project Lease Boundary (confined). Operation of the BESS and substations is predicted to have a negligible impact that is constant, unavoidable, and limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Golden Eagle

The Lease Boundary does not overlap predicted golden eagle (*Aquila chrysaetos*) breeding habitat (NatureMapping n.d.); however, the Applicant reports that suitable nesting habitat occurs along cliffs adjacent to the Columbia River (Horse Heaven Wind Farm, LLC 2022). Watson et al. (2014) suggested that golden eagle nesting may be impacted by wind farms within 8 miles of nesting sites. The Applicant reports that golden eagle nests were not observed within 10 miles of the Lease Boundary. Therefore, the Project is not expected to result in indirect loss or degradation of suitable golden eagle nesting habitat because occupancy of this habitat type has not been observed. Golden eagles were observed flying over and perching within the Lease Boundary and could forage on small mammals in the Lease Boundary. The Project may result in direct and indirect foraging habitat loss.

The Applicant has predicted that the golden eagle is the 22nd most likely large bird species to collide with the Project. While collisions may not be predicted as likely, the Applicant notes that golden eagles are predicted to continue to use the Lease Boundary during Project operation, and as a result, the Project would pose a risk of mortality due to collision. The exposure index for golden eagles under Option 1 (GE 2.82-MW and GE 3.03-MW turbines) is approximately 1.2 times greater than Option 2 (SG 5.5-MW turbine), but the same as the Option 2 SG 6.0-MW turbine proposed for Option 2. Because Option 1 would also require a greater number of turbines than Option 2, it is expected to result in a greater collision risk for golden eagles. Golden eagles may also collide with other facility infrastructure such as powerlines and weather towers. Golden eagles could collide with solar arrays if they are foraging around the facility, though there is limited information on interactions between solar facilities and raptors.

Changes in prey availability due to loss of habitat or loss of access could contribute to impacts on golden eagles' survivorship. The Applicant has not proposed the use of rodenticides that could contribute to reduction of prey and consumption of poisons by eagles.

Golden eagle populations in western North America are predicted to be stable or slightly declining (Hammerson and Cannings 2022; Katzner et al. 2020). Declines are predicted to be associated with loss of shrub and jackrabbit habitat (Katzner et al. 2020). The Project is predicted to contribute to the threats to this species due to loss of prey base and mortality. As the regional populations may be stable or slightly declining, they are expected to be moderately resilient to Project-related stresses resulting from habitat loss and mortality.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a negligible impact on golden eagles that is short term, unlikely to occur, and confined to the Project Lease Boundary. Operation of the turbines (Options 1 and 2) and comprehensive Project is predicted to have a medium-magnitude, long-term impact on golden eagles that may feasibly occur within the Project Lease Boundary (confined). Operation of the solar arrays, BESS, and substations is predicted to have a negligible, long-term impact on golden eagles that is unavoidable and confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, unlikely, and confined.

Great Blue Heron

One great blue heron (*Ardea herodias*) was observed flying within the Lease Boundary during the field studies (Horse Heaven Wind Farm, LLC 2022). Great blue herons are year-round residents within the Lease Boundary. Suitable nesting habitat is unlikely to occur within the Lease Boundary; however, nesting may occur near the Columbia and Yakima Rivers. Suitable foraging habitat within the Lease Boundary for great blue heron includes agricultural fields, grasslands, and shrubland (Horse Heaven Wind Farm, LLC 2022). Permanent disturbance would directly impact approximately 489 acres of agricultural land, 51 acres of grasslands, and 51 acres of shrubland.

Threats to great blue heron typically include contamination of food sources, alteration of foraging habitat (e.g., draining wetlands), and disturbance of nesting sites. As suitable nesting areas are not available within the Lease Boundary, indirect impacts, such as sensory disturbance, on nesting areas are not anticipated. In addition, since impacts on wetlands are not anticipated during Project operations, potential wetland foraging habitat would be unaffected. Other types of foraging habitats are available in agricultural land, grassland, and shrubland that surrounds the Project footprint, and as a result, great blue herons may avoid some of these foraging areas during Project operations due to sensory disturbance. During the breeding season, adult herons typically remain within approximately 6.2 miles (10 kilometers) of the nest but may use home ranges up to 18.6 miles (30 kilometers) (Vennesland 2004). The ZOI described above would account for the foraging habitat loss that may be an indirect impact from the Project.

The mean exposure index for great blue herons is estimated to be <0.001 for Option 1 turbines and <0.0001 for Option 2 turbines (GAL 2022; Horse Heaven Wind Farm, LLC 2022). Fatalities of great blue heron have been documented at wind turbines in Washington State, including one at the adjacent Nine Canyon Wind Farm (Horse Heaven Wind Farm, LLC 2022). Five fatalities have been documented at wind turbines in the United States. (AWWI 2020). Mortality of individuals is possible during Project operations (Horse Heaven Wind Farm, LLC 2022). Given that Option 1 would require more turbines than Option 2, Option 1 is expected to result in a greater risk of impacts on great blue heron (GAL 2022; **Appendix 4.6-1**).

Great blue herons could also collide with power lines and towers. Collisions with solar arrays are not expected, given the limited availability of foraging and nesting habitat in the Lease Boundary.

Populations in southern Washington State are predicted to be declining, potentially by more than 1.5 percent per year (Vennesland and Butler 2020). Other regional populations may be stable or increasing. The population may be stable or slightly declining and is expected to be moderately resilient to imposed stresses. The Project is not predicted to substantially contribute to habitat loss or mortality of great blue heron.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a negligible impact on great blue herons that is long term and unavoidable for habitat loss and short term and feasible for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation of the turbines (Options 1 and 2) and comprehensive Project, impacts are predicted to have a medium-magnitude, long-term impact on great blue herons that may feasibly occur within the Project Lease Boundary (confined). Operation of the solar arrays, BESS, and substations is predicted to have a negligible, long-term impact on great blue herons that is unavoidable and confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Loggerhead Shrike

One loggerhead shrike (*Lanius ludovicianus*) was observed during field surveys (Horse Heaven Wind Farm, LLC 2022). The PHS database reports seven loggerhead shrike occurrences within 2 miles of the Lease Boundary, three of which are nest sites (WDFW n.d.). Five of the loggerhead shrike occurrences are reported from within the Lease Boundary, two of which are nest locations. Nesting habitat is available within the Lease Boundary in hedgerows, around abandoned homesteads, and on shrubland (Horse Heaven Wind Farm, LLC 2022). Species-specific surveys for loggerhead shrike were not conducted for the Project (Horse Heaven Wind Farm, LLC 2022). Permanent disturbance would directly impact approximately 51 acres of grasslands and 51 acres of shrubland. An additional 706.4 acres of shrubland would be converted to low-growing grassland as modified habitat under solar arrays, which would further reduce nesting habitat.

Loggerhead shrikes are associated with shrub-steppe ecosystems and usually nest within shrubs (Johnson and O’Neil 2001). Shrubs are also used by loggerhead shrikes for singing and foraging perches, although they generally avoid foraging in dense areas of cheatgrass (*Bromus tectorum*) (Johnson and O’Neil 2001). In addition, nesting sites may be selected near ground squirrel burrows because of their influence on vegetation and landscape (Smallwood and Smallwood 2021). Project construction could result in reduced material available for nesting and may impact ground squirrel populations, which could have indirect impacts on nesting loggerhead shrikes (Smallwood and Smallwood 2021).

Loggerhead shrikes require larger nesting territories due to the species' predatory behavior (Smallwood and Smallwood 2021); therefore, habitat fragmentation from the Project could impact the number of breeding pairs in the Lease Boundary. In addition, further degradation of the remaining patches of shrubland from potential spread of invasive plants may further reduce habitat availability. For example, cheatgrass is a common invasive plant throughout the Lease Boundary, and further spread of this species would degrade the remaining native habitat for loggerhead shrikes.

One fatality of a similar species, the northern shrike (*Lanius borealis*), has been documented at a wind facility in Washington State (Horse Heaven Wind Farm, LLC 2022), and 13 loggerhead shrike fatalities have been reported across the United States in a metadata compilation of fatality reports from 227 wind power projects between 2002 and 2018 (AWWI 2020). Fatality estimates of loggerhead shrikes at wind turbines in the Altamont Pass Wind Resource Area predicted an averaged 10.6 fatalities per year once the new generation turbines were installed, which represents a reduction from 93.4 per year when the old-generation turbines were operating (Smallwood and Smallwood 2021). Based on surveys within the Lease Boundary, loggerhead shrikes are anticipated to occur during Project operations (Horse Heaven Wind Farm, LLC 2022). Certain behaviors of loggerhead shrikes may increase susceptibility to turbine strikes, such as hovering and kiting in high winds and in updrafts to search for prey, similar to hawks. These updrafts often occur at the top of slopes, which also often correspond with the siting of wind turbines (Smallwood and Smallwood 2021). Loggerhead shrikes also display chasing behavior, often chasing other birds for several hundreds of yards, which can distract them from surrounding threats such as wind turbines (Smallwood and Smallwood 2021). Similarly, loggerhead shrikes could also collide with other solar arrays and other project infrastructure such as met towers. Walston et al. (2015) reported 17 loggerhead shrike mortalities across seven solar facilities in California, equal to approximately 1.23 percent of the total mortalities recorded at those sites.

Because of the species' occurrence in the Lease Boundary, combined with its behavioral traits and considering the records of strikes at wind turbine facilities and solar facilities, Project operations are anticipated to result in fatalities. The Applicant did not provide an exposure index for loggerhead shrikes; therefore, it is expected that Option 1, which would involve a greater number of turbines than Option 2, would likely result in a higher risk to loggerhead shrikes (GAL 2022; **Appendix 4.6-1**).

Loggerhead shrike populations are estimated to be declining approximately 3.5 to 5 percent per year (Yosef 2020), although the rate of decline varies across regions. The Project is predicted to contribute to the loss of suitable loggerhead shrike foraging and nesting habitat and may pose some risk of mortality. Loggerhead shrike populations are expected to be moderately resilient to imposed stresses.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a low-magnitude impact on loggerhead shrikes that is constant and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation of the turbines (Options 1 and 2) and comprehensive Project, impacts are predicted to have a medium-magnitude, constant, unavoidable impact on loggerhead shrikes within the Project Lease Boundary (confined). Operation of the solar arrays is predicted to have a low-magnitude, constant, unavoidable impact on loggerhead shrikes that is confined to the Project Lease Boundary. Operation of the BESS and substations is predicted to result in a negligible, constant, unavoidable impact that is confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Prairie Falcon

The Lease Boundary may overlap core prairie falcon (*Falco mexicanus*) breeding habitat (NatureMapping n.d.); however, suitable nesting habitat occurs on bluffs and canyons within the Lease Boundary, and nests were reported within 5 miles of the Lease Boundary. PHS data report 12 occurrences of prairie falcon within 2 miles of the Lease Boundary, though none within the Lease Boundary (WDFW n.d.). Nine of the occurrences are nest sites. The Applicant reports prairie falcons hunting and perching in cropland and grassland, and it is expected that most of the Lease Boundary could provide suitable hunting habitat, though agricultural areas are of lower quality than native range (Steenhof 2020). Therefore, the Project is predicted to result in the permanent loss of approximately 102 acres (51 acres of grasslands and 51 acres of shrubland) of potential foraging habitat for this species. While loss and degradation of foraging habitat is considered a threat to the species, nesting habitat is generally a more limiting feature for prairie falcon than foraging habitat (Steenhof 2020). Active nests were not recorded within the Lease Boundary. In addition to direct habitat loss, the Project may disturb prairie falcons foraging in the Lease Boundary. Additional foraging habitat may be indirectly lost around turbines and other Project features.

Prairie falcons are predicted to be the 21st most likely large bird species to collide with turbines (exposure indices from 0.003 to 0.01, depending on the technology option selected). Two prairie falcon mortalities have been reported from wind farms in Washington State (Horse Heaven Wind Farm, LLC 2022). Prairie falcons were reported to be most abundant in the Lease Boundary during the fall and winter, when the species would be at greatest risk for collision. Given that the risk of collision with turbines during the summer is considered low based on species observation during field surveys, the risk of Project-related collision mortalities resulting in nest failure or impacts on fledglings is considered low.

Exposure indices for prairie falcons are 1.2 to 3.3 times greater for Option 1 than Option 2, and because Option 1 would also require a greater number of turbines than Option 2, it is expected to result in greater collision risk for prairie falcons (GAL 2022; **Appendix 4.6-1**).

Prairie falcons may also collide with other facility infrastructure such as powerlines and weather towers. Prairie falcons could collide with solar arrays if they are foraging around the facility, though there is limited information on interactions between solar facilities and raptors.

Changes in abundance of or access to prey (e.g., ground squirrels, horned lark) may also impact the survival of prairie falcons. The Applicant does not propose using rodenticides or pesticides that may be consumed by prey species; however, changes to prey occupancy of the Lease Boundary (e.g., avoidance or increased shelter under solar arrays) could impact prairie falcon hunting, resulting in changes in survivorship.

Short-term trends suggest that the North American prairie falcon population is stable (Hammerson and Cannings 2022), though populations in western North America may be declining (Steenhof 2020). Given that the populations may be stable or in slight decline, they are predicted to be moderately resilient to the impacts of the Project.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a medium-magnitude impact on prairie falcons that is constant and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation of the turbines (Options 1 and 2) and comprehensive Project, impacts are predicted to have a medium-magnitude, constant, unavoidable impact on prairie falcons within the Project Lease Boundary (confined). Operation of the solar arrays is predicted to have a low-magnitude, constant, feasible effect on prairie falcons that is confined to the Project Lease Boundary. Operation of the BESS and substations is predicted to result in a negligible, constant, unavoidable impact that is limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, unlikely, and confined.

Ring-necked Pheasant

Ten observations of ring-necked pheasants (*Phasianus colchicus*) were recorded within the Lease Boundary during field surveys for the Project (Horse Heaven Wind Farm, LLC 2022). PHS data report 10 occurrences within 2 miles of the Lease Boundary (WDFW n.d.). Ring-necked pheasant is native to Asia, but populations were introduced to North America. Breeding habitat includes most open habitats in eastern Washington. This species is highly adaptable and uses a variety of habitats. Benton County is within a pheasant management zone, and agricultural and grassland habitat in the Lease Boundary is expected to provide habitat for ring-necked pheasants (Horse Heaven Wind Farm, LLC 2022). The Project would result in permanent disturbance of 489 acres of agricultural land and 51 acres of grasslands, which could provide habitat for ring-necked pheasants.

Ring-necked pheasants could be indirectly impacted from Project operations. Ring-necked pheasants experience high road mortality, particularly in April and May (Giudice and Ratti 2020). The Project would result in an increase in permanent roads within the Lease Boundary, with the addition of 107.3 miles of access roads within the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). Access roads would be used by on-site workers for operation and maintenance purposes. This could increase the mortality of ring-necked pheasants from vehicle collisions during Project operations.

Habitat degradation has been documented throughout the range of ring-necked pheasants in the United States, with the increase in industrial-scale farming and associated loss of fallow land (Giudice and Ratti 2020). Degradation of ring-necked pheasant habitat is largely attributed to changes in agricultural practices, increased livestock grazing, increased use of pesticides, and loss of wetlands (Giudice and Ratti 2020). The Project is not anticipated to cause further degradation of ring-neck pheasant habitat beyond the areas of permanent loss, as the agricultural practices and livestock grazing within the Lease Boundary are not anticipated to change as a result of the Project.

A mean exposure index was not calculated for ring-necked pheasants because the species' flight heights were not available from field surveys (Horse Heaven Wind Farm, LLC 2022). Ring-necked pheasants spend most of their time on the ground, using walking as the main mode of locomotion. Ring-necked pheasants will run to seek cover from a threat rather than flush (Giudice and Ratti 2020). However, the species is the seventh most commonly reported fatality at wind facilities in Washington (Horse Heaven Wind Farm, LLC 2022). At the adjacent Nine Canyon Wind Project, 14 percent of bird fatalities during post-construction monitoring were ring-necked pheasants (Horse Heaven Wind Farm, LLC 2022). As ring-necked pheasant mortalities are fairly common at wind farms in the region, it is expected that the Project would result in a risk of ring-necked pheasant mortality.

Ring-necked pheasants may also collide with other facility infrastructure such as powerlines and weather towers. Ring-necked pheasants could collide with solar arrays if birds are foraging around the facility, although there is limited information on interactions between solar facilities and pheasants.

The species has been introduced to the area and is stocked by the WDFW for hunting (WDFW 2022). As ring-necked pheasants are an introduced species, adaptable to agricultural environments and anthropogenic changes, and the populations are supported through captive breeding to facilitate hunting, local populations are expected to be resilient to Project impacts.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a low-magnitude impact on ring-necked pheasants that is long term and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation of turbines (Options 1 and 2) and comprehensive Project, impacts are predicted to have a low-magnitude, long-term, unavoidable impact on ring-necked pheasants within the Project Lease Boundary (confined). Operation of the solar arrays, BESS, and substations is predicted to have a negligible, long-term, unavoidable impact on ring-necked pheasants that is confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Sagebrush Sparrow

As noted in the ASC, one sagebrush sparrow (*Artemisiospiza nevadensis*) was documented in the Lease Boundary during field surveys (Horse Heaven Wind Farm, LLC 2021a). Sagebrush sparrow is considered a shrub-steppe obligate species and occurs where shrubs, primarily big sagebrush (*Artemisia tridentata*), have greater cover (WDFW 1996). Small patches of suitable nesting and foraging habitat are present in the Lease Boundary, with larger, more contiguous shrub-steppe habitat available north of the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). PHS data report one occurrence of sagebrush sparrow within 2 miles of the Lease Boundary (WDFW n.d.). Breeding territory is variable in size and shape (Martin and Carlson 2020). Nests are usually constructed within shrubs, predominantly sagebrush, but may be constructed on the ground or in bunchgrasses (Martin and Carlson 2020). The Project would result in the permanent loss of 2 acres of shrub-steppe, and an additional 0.3 acres within the solar arrays would become modified habitat. In addition, it is predicted that approximately 1,019 acres of shrub-steppe habitat is within the ZOI and may be impacted during operation. Permanent loss and disturbance from the Project could reduce breeding and foraging opportunities for sagebrush sparrows.

Habitat fragmentation, in general, is likely the largest indirect impact on sagebrush sparrow populations regionally. Shrub-steppe ecosystems have been impacted by livestock grazing, conversion to agricultural land, and energy and natural resource development, leaving many shrub-steppe ecosystems severely fragmented (Knick et al. 2003). As a shrub-steppe obligate species, further degradation or fragmentation of remaining habitat could impact populations. While population changes are not typically observed directly after alteration of vegetation, densities of sagebrush sparrow may decline in subsequent years (Martin and Carlson 2020).

One fatality of sagebrush sparrow has been recorded at wind farms in Washington (Horse Heaven Wind Farm, LLC 2022). Mean exposure indices for sagebrush sparrows were not calculated because observations do not have associated flight heights (Horse Heaven Wind Farm, LLC 2022). Sparrows account for an estimated 6.0 percent of all bird mortalities at wind turbines; however, sagebrush sparrow mortalities specifically have not been reported (Erickson et al. 2014). Foraging by sagebrush sparrows is typically done while walking or hopping on the ground. On breeding ranges, individuals engage in long or short flights when disturbed, generally over the top of shrubs (Martin and Carlson 2020). As these movement behaviors are generally low to the ground (e.g., near the top of shrubs), these behaviors limit the likelihood of interaction with turbine strike zones.

Sagebrush sparrows could collide with other Project infrastructure, such as solar arrays, towers, and buildings. Walston et al. (2015) reported that three fatalities of sagebrush sparrow were recorded at one of seven solar facilities included in their review of avian mortality at solar facilities between 2011 and 2014, representing 1.95 percent of the total mortalities recorded among the facilities. Sagebrush sparrow populations are in decline, notably in Washington (Martin and Carlson 2020). However, based on the low incidence of occurrence within the Lease Boundary, movement behaviors, and the low observed mortality rate for the species, the Project is not anticipated to substantially contribute to population decline for sagebrush sparrow.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a low-magnitude impact on sagebrush sparrows that is constant and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation of the turbines (Options 1 and 2), solar arrays, and comprehensive Project, impacts are predicted to be medium magnitude, constant, unavoidable and confined to the Project Lease Boundary. Operation of the BESS and substations is predicted to have a negligible, long-term, unavoidable impact on sagebrush sparrows that is confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Sage Thrasher

Three observations of sage thrasher (*Oreoscoptes montanus*) were recorded within the Lease Boundary during field surveys in spring and fall (Horse Heaven Wind Farm, LLC 2022). Small patches of suitable nesting and foraging habitat are present in the Lease Boundary, and larger, more contiguous shrub-steppe habitat is available north of the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). Sage thrasher is likely to occur within the Lease Boundary during the Operation Stage of the Project. PHS data do not report occurrences of sage thrasher within 2 miles of the Lease Boundary (WDFW n.d.). Sage thrasher is a shrub-steppe obligate species and occurs more frequently where cover is dominated by shrubs, primarily big sagebrush. Mean breeding territory size is variable and has been observed to range from approximately 2.4 acres (0.96 hectares) in Idaho to approximately 0.96 acres (0.39 hectares) in central Washington (Reynolds et al. 2020). The Project would result in the permanent loss of 2 acres of shrub-steppe, and an additional 0.3 acres would become modified habitat within solar arrays. In addition, it is predicted that 1,019 acres of shrub-steppe habitat is within the ZOI and may be impacted during operation. Permanent loss and disturbance from the Project could reduce nesting and foraging opportunities for sage thrashers.

Nests are constructed mainly in shrubs, predominantly sagebrush, but sage thrashers may construct nests on the ground under sagebrush (Reynolds et al. 2020). Habitat fragmentation, as discussed above, could impact breeding use by sage thrashers in the Lease Boundary. Habitat fragmentation is associated with increased nest predation and parasitism, resulting in reduced nest success in fragmented shrub-steppe. This may be a result of increased edge effects in fragmented landscapes (Johnson and O’Neil 2001). Increasing the linear distance of transmission lines may also increase predation on species breeding in sagebrush shrub-steppe (Knick et al. 2003).

In addition, sage thrashers are sensitive to human disturbance during the breeding season and will not approach the nest if an observer is within approximately 492 feet (150 meters approximately) (Reynolds et al. 2020). Increased human activity, including construction and maintenance workers and vehicle traffic, could cause indirect disturbance to nesting sage thrashers in the Lease Boundary.

One fatality of sage thrasher has been recorded at wind farms in Washington (Horse Heaven Wind Farm, LLC 2022). Mean exposure indices for sage thrasher were not calculated because observations do not have associated flight heights (Horse Heaven Wind Farm, LLC 2022). Sage thrashers commonly move by running within breeding territories and use quick, low flights as an escape response to seek cover (Reynolds et al. 2020). Sage thrashers could collide with other Project infrastructure, such as solar arrays, towers, and buildings.

Sage thrasher populations have declined an estimated 10 to 30 percent since 2003 (Hammerson and Cannings 2022). The Project is predicted to alter sage thrasher habitat, and construction and maintenance activities may disturb nesting thrashers. Sage thrashers are not expected to have frequent mortalities at the site.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, comprehensive) is predicted to have a low-magnitude impact on sage thrasher that is constant and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Lease Boundary. During the operation of turbines (Options 1 and 2), solar arrays, and comprehensive Project, impacts are predicted to be medium magnitude, constant, unavoidable and confined to the Project Lease Boundary. Operation of the BESS and substations is predicted to have a negligible, long-term, unavoidable impact on sage thrasher that is confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Sandhill Crane

Observations of sandhill cranes (*Antigone canadensis*) totaled 3,050 individuals in 27 groups during field surveys for the Project. The majority of observations were during fall (Horse Heaven Wind Farm, LLC 2022). Sandhill cranes were observed traveling over the Lease Boundary but were not recorded landing or using habitat in the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). Sandhill cranes observed flying over the Lease Boundary were migratory individuals, and suitable stopover habitat, which includes agricultural land interspersed with wetlands, is largely absent from the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). However, transient individuals may forage in agricultural land within the Lease Boundary. Permanent disturbance from the Project would result in the direct loss of 489 acres of agricultural land.

Sandhill cranes have the highest mean use of the special status bird species observed during field surveys for the Project. The exposure index for sandhill cranes under Option 1 is approximately eight times less than under Option 2 (GAL 2022 [**Appendix 4.6-1**]; Horse Heaven Wind Farm, LLC 2022). Few post-construction studies have documented mortalities of sandhill crane at wind farm facilities; one was documented in the Altamont Pass Wind Resource Area in California, and two at wind facilities in west Texas (Horse Heaven Wind Farm, LLC 2022). No fatalities of sandhill crane have been documented at the adjacent Nine Canyon Wind Farm (Horse Heaven Wind Farm, LLC 2022). Sandhill cranes may not be particularly susceptible to risk of collision with turbines. Studies at wind facilities in other parts of the United States have shown that sandhill cranes are likely to avoid turbines despite relatively high numbers being observed within and surrounding wind facilities (Nagy et al. 2012; Pearse et al. 2016).

Sandhill cranes could collide with other Project infrastructure, such as solar arrays, towers, and buildings However, as sandhill cranes have not been reported using habitat or landing in the Lease Boundary they are expected to be less likely to collide with ground-based facilities.

The Central Valley sandhill crane population, which is predominantly composed of greater sandhill crane (*A. c. tabida*), appears to be increasing (WDFW 2022). Systematic surveys and population trend analysis is not available for the Pacific flyway population, which is predominantly composed of lesser (*A. c. canadensis*) and

Canadian (*A. c. rowani*) sandhill cranes (Gerber et al. 2020). The Project does not provide unique habitat, and although sandhill cranes were documented flying over the Lease Boundary, the species may be able to avoid turbines. Therefore, it is expected that sandhill cranes may be resilient to Project impacts.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a negligible impact on sandhill cranes that is long term and unavoidable for habitat loss and short term and feasible for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During the operation of turbines (Options 1 and 2) and comprehensive Project, impacts are predicted to have a medium-magnitude, long term impact on sandhill cranes that may feasibly occur within the Project Lease Boundary (confined). Operation of the solar arrays, BESS, and substations is predicted to have a negligible, long term impact on sandhill cranes that is unavoidable and confined to the Project Lease Boundary. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Tundra Swan

Tundra swans (*Cygnus columbianus*) were documented in the Lease Boundary during surveys completed for the Project (Horse Heaven Wind Farm, LLC 2022). Suitable habitat for tundra swans within the Lease Boundary includes agricultural land, where they may forage on available grain following harvest. Permanent disturbance of approximately 489 acres of agricultural land would occur from Project construction (Horse Heaven Wind Farm, LLC 2022).

In addition, Project operations could cause indirect impacts on tundra swans. Avoidance of suitable habitat in proximity to wind turbines may alter tundra swans' use of the Lease Boundary. A review of the response of swans and geese to wind turbines found displacement distances of approximately 656 to 1,837 feet (200 to 560 meters) for swans at onshore facilities, and 98 to 1,969 feet (30 to 600 meters) for geese (Rees 2012). Approximately 39,169 acres of agricultural land may be disturbed by the Project.

Exposure indices for tundra swans are 0.011 for Option 1 and zero at all other turbine technologies. Because Option 1 would also require a greater number of turbines than Option 2, it is expected to result in greater collision risk for tundra swans. No fatalities of tundra swans have been documented at wind facilities in Washington (Horse Heaven Wind Farm, LLC 2022). Swans and geese may exhibit avoidance of wind turbines, given the high number of observations at wind facilities and low incidence of collision mortality (Rees 2012). Avoidance behavior can result in increased energetic costs for migrating swans, which can vary depending on the proximity of the disturbance to breeding and foraging areas (Rees 2012).

Mortality of water-associated birds, such as tundra swans, may occur if birds attempt to land on solar arrays. Tundra swans flying over the Lease Boundary could perceive solar arrays as waterbodies (lake effect).

Tundra swan populations throughout North America are predicted to be increasing; however, the western populations are estimated to be declining approximately 2.3 percent per year (Limpert et al. 2020). The Project may reduce the amount of foraging habitat for tundra swans; however, it is expected that tundra swans may avoid the Lease Boundary during Project operation. As such, tundra swans are expected to be moderately resilient to Project-related impacts.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a low-magnitude impact on tundra swans that is long term and unavoidable for habitat loss and short term and feasible for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation under Turbine Option 1 and the comprehensive Project, impacts are predicted to be low magnitude, long term, and may feasibly occur within the Project Lease Boundary (confined). Operation under Turbine Option 2 is predicted to have a negligible impact on tundra swans that is long term, feasible, and confined to the Project Lease Boundary. Operation of the solar arrays is predicted to have a low-magnitude, long term impact on tundra swans that may feasibly occur within the Project Lease Boundary (confined). Operation of the BESS and substations is predicted to have a negligible, long term, unavoidable impact that is limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Vaux's Swift

Vaux's swifts (*Chaetura vauxi)* were not documented during field surveys conducted by the Applicant within the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). Suitable breeding habitat for this species includes coniferous or mixed forest, with a preference for old-growth forest (Schwitters et al. 2021). Vaux's swifts roost in nest trees during the breeding season and often use chimneys for roosting during migration (Schwitters et al. 2021). Suitable nesting and roosting habitat does not occur within the Lease Boundary, though Vaux's swifts may migrate over the Lease Boundary. The Project is not anticipated to directly or indirectly impact habitat for Vaux's swifts, though Project operation could disturb migrating Vaux's swifts.

Five fatalities of Vaux's swift were documented at 196 surveyed wind facilities in the United States between 2002 and 2018 (AWWI 2020). Flocking birds, such as Vaux's swifts, may be more susceptible to strikes during migration (Román et al. 2020). The Project is not anticipated to cause mortality of Vaux's swifts, given their low occurrence in the Lease Boundary, lack of suitable nesting and roosting habitat, and low incidence of collisions at other wind farm facilities.

Construction of the Project construction (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a negligible impact on Vaux's swift that is short term and unlikely to occur within the Project Lease Boundary (confined). During the operation of the turbines (Options 1 and 2) and the comprehensive Project, impacts are predicted to be low magnitude and long term and may feasibly occur within the Project Lease Boundary (confined). Operation of the solar arrays, BESS, and substations is predicted to have a negligible, long-term impact on Vaux's swifts that is unlikely to occur within the Project Lease Boundary (confined). Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, unlikely, and confined.

Black-tailed Jackrabbit and White-tailed Jackrabbit

The Lease Boundary has been mapped as suitable habitat for black-tailed jackrabbits (*Lepus californicus*) based on predictive mapping provided by the Applicant, while suitable white-tailed jackrabbit (*Lepus townsendii*) habitat is generally patchy across the Lease Boundary (Horse Heaven Wind Farm, LLC 2021c). The Applicant notes that these species are rare in the Lease Boundary (Horse Heaven Wind Farm, LLC 2022). PHS data report five occurrences of black-tailed jackrabbit within 2 miles of the Lease Boundary (WDFW n.d.). Although the species are regionally rare, the Lease Boundary provides suitable habitat, and the Project is predicted to result in the direct loss of approximately 102 acres of shrub and grassland habitat that could support these species. The Project is predicted to result in the temporary loss of 601 acres of suitable habitat and modification of 1,019 acres of potentially suitable habitat. The response of small mammals to wind turbines is not well studied (Arnett et al. 2007), although, in their assessment of response to wind facilities in an agricultural setting, Łopucki et al. (2017) noted that European hares (*Lepus europaeus*) appeared to avoid turbines and the surrounding 0.44 miles (700 meters). WHCWG (2012) notes that wind power projects generally result in limited direct habitat loss;

however, associated road and transmission line infrastructure can alter the suitability of habitat. The ZOI applied for the Project is expected to include indirect black-tailed and white-tailed jackrabbit habitat loss. Therefore, approximately 13,260 acres of suitable habitat (grassland and shrub) may be indirectly lost or disturbed due to Project operation.

Solar arrays may provide novel shelter for jackrabbits that reduces predation by aerial predators (e.g., raptors). Vegetation would be maintained under the solar arrays, which may attract jackrabbits, depending on ground conditions.

Sources of potential black-tailed and white-tailed jackrabbit mortalities are expected to include interaction with construction equipment and road-based mortalities during operation. Jackrabbits are vulnerable to road mortality (WHCWG 2012), although the risk of mortality is linked to traffic volumes and speeds. Limited Project-related traffic is predicted during the Operation Stage of the Project, reducing potential risk of mortality for jackrabbits. In addition, transmission poles can increase the availability of perch sites for raptors, increasing predation pressure on jackrabbits (WHCWG 2012).

New access roads that create linear disturbances across the landscape would potentially fragment remaining jackrabbit habitat, particularly where roads bisect shrub and grassland habitats. Roads are listed as a major connectivity threat to jackrabbits by creating barriers to limit access to shrub and grassland habitats (WHCWG 2012).

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a low-magnitude impact on black-tailed and white-tailed jackrabbits that is constant and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During the operation of the turbines (Options 1 and 2) and the comprehensive Project, impacts are predicted to be medium magnitude, constant, and unavoidable within the Project Lease Boundary (confined). Operation of the solar arrays is predicted to have a low-magnitude, constant impact that is feasible within the Project Lease Boundary. Operation of the BESS and substations is predicted to have a negligible, long-term, and unavoidable impact that is limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Townsend's Big-eared Bat

Townsend's big-eared bats (*Corynorhinus townsendii*) were not recorded during bat acoustic surveys conducted by the Applicant for the Project (Horse Heaven Wind Farm, LLC 2022). Suitable habitat for this species is minimal within the Lease Boundary due to the absence of roosting and hibernacula sites (Horse Heaven Wind Farm, LLC 2022). Townsend's big-eared bats may travel up to approximately 6.5 miles (10.5 kilometers) from roost sites to forage (Gruver and Keinath 2006). Foraging occurs in a variety of habitat, including riparian areas, forests and edge habitats, woodlands, and sagebrush shrub-steppe; however, foraging areas may be selected based on proximity to available roosting sites (Gruver and Keinath 2006). Suitable foraging habitat could exist over the Lease Boundary in shrubland, but it is uncertain whether roosting sites exist in the surrounding landscape. Townsend's big-eared bats have not been documented in the southern Columbia Basin (WDFW 2022).

Bat fatality studies at the adjacent Nine Canyon Wind Farm documented 27 bat fatalities of the silver-haired bat (*Lasionycteris noctivagans*) and hoary bat (*Lasiurus cinereus*) species, but no Townsend's big-eared bat fatalities (Erickson et al. 2003). Bat fatalities were estimated to be approximately 3.21 bats per turbine per year (Erickson et al. 2003). Limited information on fatalities of Townsend's big-eared bats at wind facilities is available. As suitable roosting habitat does not occur in the Lease Boundary, and since the species was not detected during the surveys, Project operation is anticipated to have limited impact on Townsend's big-eared bat mortality.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a negligible impact on Townsend's big-eared bat that is short term, feasible, and confined to the Project Lease Boundary. During operation of the turbines (Options 1 and 2) and the comprehensive Project, impacts are predicted to be low magnitude, long term, and probable within the Project Lease Boundary (confined). Operation of the solar arrays is predicted to have a low-magnitude, long-term impact that is unlikely to occur within the Project Lease Boundary (confined). Operation of the BESS and substations is predicted to have a negligible, long-term, and unlikely impact that is limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, unlikely, and confined.

Townsend's Ground Squirrel

The Lease Boundary overlaps Townsend's ground squirrel (*Urocitellus townsendii*) habitat concentration areas (HCAs), as well as mapped predicted core Townsend's ground squirrel habitat (NatureMapping n.d.). Grassland and shrub-steppe habitats within the Lease Boundary are expected to provide suitable habitat, while other habitats, such as agricultural fields and roadsides, could provide marginal habitat. The Applicant estimates that six turbines may be sited in HCAs modeled as medium concentration. The eastern solar array also overlaps a medium-concentration HCA. PHS data report nine occurrences of Townsend's ground squirrels within 2 miles of the Lease Boundary (WDFW n.d.). The Applicant predicts that the Project would result in the loss of approximately 1,554 acres of suitable Townsend's ground squirrel habitat. It is estimated that the Project may result in a loss of approximately 102 acres of grassland and shrub-steppe habitat that could provide potentially suitable Townsend's ground squirrel habitat, as well as temporary loss and modification of 601 acres and 1,019 acres, respectively, of potentially suitable habitat. The Project would also impact one of the two Townsend's ground squirrel colonies in the Lease Boundary, which is located within the temporary disturbance footprint. This would result in a loss of denning habitat for the species.

There is limited information on the response of small mammals, including Townsend's ground squirrel, to wind power projects. California ground squirrels (*Spermophilus beecheyi*) near the Altamont Pass Wind Resource Area are reported to show greater levels of predator vigilance and returned to burrows more frequently when located closer to turbines (Rabin et al. 2006). Łopucki et al. (2018) reported that common voles display a physiological response (increased corticosterone concentrations, indicating stress response) in individuals living closer to turbines, although they also reported that a similar response was not observed in striped field mice. Łopucki et al. (2018) postulate that striped field mice have more behavioral plasticity and commonly live near humans, suggesting that some species may be adaptable to wind power disturbances. It is unknown whether disturbance from wind turbines would result in long term effects on local Townsend's ground squirrel populations, although observations from the Stateline Wind Farm suggest that ground squirrel populations have remained stable post-construction (WHCWG 2012). It is expected that the ZOI developed for the Project is sufficiently conservative to capture Townsend's ground squirrel habitat that may be indirectly impacted by the Project.

Solar arrays may provide novel shelter for Townsend's ground squirrels that reduces predation by aerial predators (e.g., raptors). Vegetation would be maintained under solar arrays, which could attract Townsend's ground squirrels to these locations, depending on ground conditions.

Potential sources of Project-related ground squirrel mortalities include collisions with construction equipment, fatalities during ground-disturbing activities near colonies, and road-based mortalities during construction and operation. Risk of mortalities is expected to increase during construction activities near colonies. The Applicant reports that two known colonies of Townsend's ground squirrels occur within the Lease Boundary, one of which would be directly disturbed by the Project. Risk of Townsend's ground squirrel mortalities is expected to be highest during work near active colonies. While two colonies are known to occur within the Lease Boundary, species-specific surveys were not conducted; therefore, there is potential for additional colonies to be present. Townsend's ground squirrels may also live near roads bordered by natural vegetation and are vulnerable to mortality during road crossings. The Project is expected to generate low traffic volumes during the Operation Stage, which would be a limited risk to ground squirrels. New transmission poles would increase available raptor perching habitat, potentially increasing predation pressures near these features. The Project is not expected to require the use of rodenticides or pesticides that could be consumed by ground squirrels.

New access roads, particularly in grassland, shrub land, and more complex agricultural fields, may further fragment Townsend's ground squirrel habitat. Ground squirrels have been observed crossing smaller roads (WHCWG 2012); therefore, it is expected that minor access roads constructed for Project use would not create substantial barriers to movement.

Townsend's ground squirrel population and population trends in Washington State are unknown (WDFW 2022), though Hammerson and Canning (2022) estimate that the population may have declined more than 70 percent as the species is absent from much of its former range, with 10 percent of natural habitat remaining within the historical range. As the species is able to persist in some built infrastructure areas, it is expected that the population has moderate resilience to disturbance, but may have low resiliency to loss or damage of remaining colonies.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, and substations) is predicted to have a medium impact on Townsend's ground squirrels that is constant and unavoidable for habitat loss and short term and probable for disturbance and mortality. Construction impacts are expected to be confined to the Project Lease Boundary. During operation of the turbines (Options 1 and 2), solar arrays, and comprehensive Project, impacts are predicted to be medium magnitude, constant, and feasible within the Project Lease Boundary (confined). Operation of the BESS and substations is predicted to have a negligible, constant, and feasible impact that is limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

Pronghorn Antelope

Pronghorn antelopes have been re-introduced to Washington State by the Yakama Nation. While not a special status species, it is understood that the species is important for the Yakama Nation. Pronghorn antelopes were re-introduced onto the Yakama Reservation, located west of the Lease Boundary, but have since moved into adjacent areas (Fidorra et al. 2019). Winter surveys documented pronghorn antelope occurrence in the western portion of the Lease Boundary (Tetra Tech 2021). Fidorra and Peterson (2021) report groups of pronghorn antelope varying in size (1 to 24 individuals) in the western, central, and eastern parts of the Lease Boundary. The Project is predicted to result in the loss of approximately 51 acres of shrub, 51 acres of grassland, and 489 acres of agricultural land that could be used by pronghorn antelopes. Fencing around solar arrays is expected to limit pronghorn antelope access to habitat around solar arrays.

Research on pronghorn antelopes' response to wind power projects reports variable results. Smith et al. (2020) found that female pronghorns avoided wind turbines in their winter range, whereas the Applicant notes that other studies have reported inconsistent responses by pronghorn antelopes to wind power projects (Tetra Tech 2021). Landon et al. (2000) reported that pronghorn antelopes generally preferred areas with lower noise levels (<45 decibels). Based on the available information, it is reasonable to expect that pronghorn antelopes may avoid Project construction activities and, potentially, operational activities (Tetra Tech 2021). It is expected that the ZOI selected for the Project (0.5 miles) would sufficiently encompass habitat indirectly lost as a result of Project-related disturbance.

The Applicant reports road-related mortalities and entanglement with barbed wire fence as potential sources of direct pronghorn antelope mortality (Horse Heaven Wind Farm, LLC 2022a). Increased road density due to the Project would increase the risk of road-related mortality, though Project-related traffic is predicted to be low. Fencing around solar arrays would include a 6-foot-high security fence; however, would not include barbed wire, as per the Applicant commitments, as such Project-related fencing is not expected to pose a potential risk of pronghorn antelopes' mortality. Alteration in access to, or disturbance of, suitable wintering and foraging habitat could lead to reduced pronghorn antelope survivorship or fecundity. There is insufficient information on habitat use by the re-introduced herd within the Lease Boundary to understand if the required extent of seasonal pronghorn habitat is provided by available habitat within the Lease Boundary.

Data provided by Yakama Nation and data presented in Fidorra and Peterson (2021) suggest that pronghorn antelope move through steppe-shrub and dryland crops along the Horse Heaven Hills ridge. If Project operations deter pronghorn antelope habitat use or movement, the Project could create a barrier to west-east movement. Data presented by Yakama Nation suggests that regionally occurring groups of pronghorn antelope may avoid canyons and irrigated agricultural areas (Yakama Nation, n.d.).. If pronghorn antelope avoid the Project during operation this new barrier could act cumulatively with avoidance of canyons and irrigated agricultural areas to restrict pronghorn movement. However, there is insufficient information on the movement patterns of the re-introduced herd to understand how, or if, the Project may influence movement.

Construction of the Project (Turbine Options 1 and 2, solar arrays, BESS, substations, and comprehensive Project) is predicted to have a medium-magnitude impact on pronghorn antelope that is constant and unavoidable for habitat loss and short term and probable for disturbance. Construction impacts are expected to be confined to the Project Lease Boundary. During the operation of the turbines (Options 1 and 2) and the comprehensive Project, impacts are predicted to be medium-magnitude, constant, and unavoidable within the Project Lease Boundary (confined). Operation of the solar arrays is predicted to result in medium-magnitude, constant, unavoidable impacts within the Project Lease Boundary (confined), while operation of the BESS and substations is predicted to have a negligible, long-term, and unavoidable impact that is limited in extent. Impacts from decommissioning for all components and the comprehensive Project are predicted to be negligible, short term, feasible, and confined.

4.6.2.5 Recommended Mitigation Measures

This section describes the measures that would reduce or compensate for impacts related to wildlife and habitat from construction, operation, and decommissioning of the Project. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Project.

EFSEC has identified the following mitigation measures for the Project to avoid and/or minimize potential impacts on wildlife and habitat.

Wild-1:[34] Post-construction bird and bat fatality monitoring and management.

Post-construction bird and bat fatality monitoring program

Prior to initiation of operation, the Applicant would develop, in coordination with the Technical Advisory Committee (TAC) and approval by EFSEC, a post-construction bird and bat fatality monitoring program. Monitoring would be conducted for a minimum of three years. While the three years of monitoring need not be consecutive, all post-construction monitoring would be conducted within the initial five years of operation to document variation in annual fatality rates. The program would describe survey methods, timing, and effort as described in the Applicant’s Bird and Bat Conservation Strategy (Appendix M of the ASC). Surveys would include carcass surveys to document the longevity of carcass persistence and detectability of carcasses. Surveys would be conducted year-round to account for variation in bird and bat abundance and diversity. Additional surveys (e.g., survey frequency) would be conducted during sensitive periods for birds and bats (e.g., migration periods). Surveyed area would include turbines, solar arrays, and transmission lines at a minimum.

Bird and bat fatality adaptive management strategy development

Prior to initiation of operation, the Applicant would develop, in coordination with the TAC and approval by EFSEC, an adaptive management strategy. The adaptive management strategy would include additional mitigation measures to be applied during sensitive periods (e.g. migration) or if mortality thresholds are exceeded.

Migratory bat species are at risk of population level impacts due to wind power facilities and these species are most at risk of collisions with turbines during spring and fall migration. As such, adaptive management strategies will be applied during these sensitive periods, which are generally April to June (spring migration) and August to October (fall migration) (Hayes and Wiles 2013). Acoustic surveys during operation may be used to define a project-specific migratory period. Acoustic detectors may be deployed across the Lease Boundary prior to spring and fall migration to detect increased bat activity suggesting the onset of bat migration. These data would be used to adjust the generalized bat sensitive periods listed above. Similarly, acoustic data would be used to document the end of bat migration and when adaptive management strategies may no longer be required. Bat data would be downloaded and analyzed on a weekly basis to document the start and end of migration.

Adaptive management mitigation strategies that would be considered include altering the operation of the turbines by increasing the cut-in speed to above 18 feet (5.5 meters) per second (Alberta Government 2013) and curtailing turbines during known bird and bat migration period. As noted in in Section 4.6.2.2, projected impacts of wind power projects estimate that wind power could result in mortality levels of 3 to 46 percent of the hoary bat population by 2050. Friedenberg and Frick (2021) conclude that a 5 m/s curtailment could avoid hoary bat extinction in several of the modeled scenarios. Acoustic monitors and smart curtailment may also be included in adaptive management to refine data on bat presence near turbines and when curtailment mitigation should be implemented. Mitigation strategies may be limited to groups of turbines based on the results of post-construction monitoring.

[34] Wild-: Identifier of numbered mitigation item for Wildlife

Bird and bat fatality adaptive management review

The Applicant, the TAC, EFSEC, and WDFW would review the results of the bird and bat post-construction fatality monitoring program after each monitoring period to determine whether the mitigation measures outlined in the adaptive management strategy should be revised or adjusted. The data would also be used to determine whether monitoring efforts are sufficient to verify predicted impacts on birds and bats. EFSEC may require the Applicant to conduct more intensive surveys (e.g., additional spatial extent or frequency) or extend the duration of post-construction monitoring beyond the minimum three years. The Adaptive management mitigation strategies should be periodically reviewed (minimum of every five years) with the TAC during operation to consider inclusion of new science and technologies that may more efficiently reduce bird and bat fatalities.

Rationale: This mitigation allows for continued monitoring and adaptive management of potential Project-related wildlife mortalities.

Wild-2: All trash containers would be wildlife-resistant.

Rationale: This mitigation measure reduces potential human-wildlife conflicts, thereby reducing potential Project-related wildlife mortalities.

Wild-3: The Applicant would provide EFSEC a summary of the consultation undertaken with the USFWS regarding eagle mortality.

Rationale: This mitigation measure allows for continued monitoring and adaptive management of potential Project-related impacts on eagles.

Wild-4: The Applicant would avoid the use of pesticides, including rodenticides, during Project construction and operation. If pesticides are required, the Applicant would, prior to application of the pesticides, develop a management plan for submission to and approval by EFSEC that describes how the Applicant would avoid and/or otherwise minimize potential impacts on wildlife, including all potentially impacted special status species.

Rationale: This mitigation measure reduces potential impacts on habitat and wildlife mortality while allowing for adaptive management of potential Project-related impacts.

Wild-5: The Applicant would limit construction disturbance by identifying sensitive areas on mapping and flagging in the field exclusion zones around any sensitive areas, including wildlife features, such as wildlife colonies, active nests, dens, and wetlands. Encroachment into exclusion zones required during construction would be reviewed by the Applicant's biologist to determine the impacts on the feature and recommend additional measures to manage impacts to the resource. The Applicant would provide information on where encroachment would be required, the rationale for encroachment, and additional mitigation measures for EFSEC to review prior to implementation. The Applicant would conduct ongoing environmental monitoring during construction to ensure that flagged exclusion zones are avoided.

Rationale: This mitigation measure reduces potential loss of habitat and wildlife mortality.

Wild-6: The Applicant would maintain a database of road mortalities throughout construction and operation as part of the operational procedures. The Applicant would review road-based mortalities annually and propose additional mitigation for areas, under the control of the Applicant, with frequent mortalities or wildlife crossing observations. Additional mitigation measures may include speed control, signage, temporary road closures (e.g., during migration periods), or wildlife passageways and would be reviewed and approved by EFSEC prior to implementation.

Rationale: This mitigation measure allows for continued monitoring and adaptive management of potential Project-related wildlife mortalities.

Wild-7: The Applicant would schedule construction activities to occur during daylight hours, when feasible, to reduce disturbance of nocturnal species and the need for nighttime lighting.

Rationale: This mitigation measure reduces disturbance to wildlife (i.e., indirect loss).

Wild-8: Wind turbine buffer zones would be established around all known raptor nests and be a minimum of 0.25 miles. The Applicant would prepare a Raptor Nest Monitoring and Management Plan for review by EFSEC and the PTAG if buffer zones cannot be maintained.

Rationale: This mitigation measure reduces potential impacts on habitat and raptor mortality while allowing allow for adaptive management of potential Project-related impacts.

Wild-9: Vegetation clearing and grubbing would avoid local bird breeding periods, when feasible, to reduce potential destruction or disturbance of nesting birds. If avoidance of this period is not feasible, additional mitigation measures, such as pre-construction surveys for and buffering of active bird nests, would be undertaken.

Rationale: This mitigation measure avoids or reduces potential bird mortality.

Hab-1:[35] The Applicant would locate Project components, including roads and powerlines, outside of movement corridors modeled in WWCWG (2013) as medium to very high linkage, to the extent feasible. The Applicant would provide rationale to EFSEC for siting components within movement corridors, and a Corridor Mitigation Plan would be required that describes:

- Extent of direct and indirect habitat impact within the movement corridor
- Proposed measures to be implemented to reduce potential impacts on movement corridors (e.g., habitat enhancements to promote continued use of corridors)
- Proposed features (e.g., open-bottom culverts) to accommodate wildlife movement for linear Project components (e.g., roads, powerlines)
- Proposed restoration in movement corridors following Project decommissioning
- Performance standards to assess the effectiveness of mitigation measures and restoration
- Methods to monitor and measure performance standards

The Corridor Mitigation Plan would be developed in consultation with the PTAG and reviewed and approved by EFSEC prior to implementation. Results of corridor monitoring would be reviewed annually with the TAC

[35] Hab-: Identifier of numbered mitigation item for Habitat

to evaluate the effectiveness and apply additional measures if necessary. Data would be provided to EFSEC with additional mitigation measures for review and approval prior to implementation.

Rationale: This mitigation measure reduces potential Project-related barriers to wildlife movement while allowing for continued monitoring and adaptive management of potential Project-related barriers.

Hab-2: Transmission line crossings of canyons and draws would be minimized. Where crossings are required, the Applicant would provide EFSEC with rationale for the crossings and propose additional mitigation measures to reduce potential barriers to movement (e.g., retaining vegetation under transmission lines) and wildlife collisions (e.g., installing flight diverters on overhead lines). EFSEC would approve the final transmission line layout, mitigation, and adaptive management strategy.

Rationale: This mitigation measure reduces potential Project-related barriers to wildlife movement while allowing for continued monitoring and adaptive management of potential Project-related barriers.

Hab-3: Temporary laydown areas. Temporary laydown areas would be situated out of native shrub-steppe habitat. Where temporary disturbance of shrub-steppe habitat is required, the Applicant would provide EFSEC with rationale and propose additional mitigation measures to reduce habitat loss.

Rationale: This mitigation measure avoids and reduces impacts on habitat while allowing for adaptive management of potential Project-related habitat loss.

Hab-4: The Applicant, in consultation with EFSEC, would establish a Pre-operational Technical Advisory Group (PTAG) and Technical Advisory Committee (TAC). The PTAG would be established at least one year prior to construction and would be responsible for reviewing and providing technical advice on documents produced by the Applicant related to wildlife and wildlife habitat. The PTAG would also provide advice on adaptive management. The PTAG would be responsible for, at a minimum:

- Reviewing and providing technical advice on Project wildlife and habitat management plans (e.g., ferruginous hawk management plan)
- Reviewing and providing advice to EFSEC on pre-design and pre-construction data collection requirements to address Project mitigation measures and conditions of management plans
- Reviewing and providing advice to EFSEC on the final Project design
- Advising on thresholds to be applied to the Project that would trigger the requirement for additional mitigation measures

The Applicant, in consultation with EFSEC, would establish a TAC prior to Project operation. The PTAG would cease to exist once the Applicant has completed all planned construction and would be replaced by the TAC, which would exist for the life of the Project. The TAC would be responsible for, at a minimum:

- Advising on the monitoring of mitigation effectiveness and reviewing monitoring reports
- Advising on additional or new mitigation measures that would be implemented by the Applicant to address exceedances of thresholds

- Reviewing the results of annual data generated from surveys and incidental observations and providing recommendations for alternative mitigation and adaptive management strategies, as well as advising on aspects of existing mitigation that are no longer needed.

The PTAG and TAC may include representation by WDFW, the Washington Department of Natural Resources, interested tribes, Benton County, and the USFWS. The PTAG and TAC may also include local interest groups, not-for-profit groups, and landowners. The exact composition of the PTAG and TAC would be determined through discussions between the Applicant and EFSEC and would depend on the relevance and/or availability of proposed members.

Rationale: This mitigation measure avoids and reduces impacts on wildlife and habitat, including habitat loss, wildlife disturbance, barriers to movement, and wildlife mortality. Further the mitigation measure will allow for continued monitoring and adaptive management of potential Project-related impacts.

Hab-5: As noted by the Applicant, the Project is expected to result in indirect habitat loss through loss of habitat function and changes in wildlife behavior in response to the Project. Further, as noted by the Applicant, WDFW guidelines require that compensatory habitat mitigation must fully offset the loss of habitat function and value. To address indirect habitat loss associated with the Project, the Applicant would develop an Indirect Habitat Loss Management Plan that addresses potential indirect habitat loss resulting from the Project. The Applicant would work with the PTAG during the development of the Indirect Habitat Loss Management Plan (IHLMP) for review and approval by EFSEC. EFSEC and the PTAG would review the IHLMP prior to its implementation. The IHLMP would be provided to the PTAG for review 90 days prior to construction.

The objectives of the IHLMP would be to identify a Project-specific ZOI and required mitigation based on the Project-specific ZOI. The Project-specific ZOI would be developed based on Project conditions and may differ from the ZOI presented in the EIS. The IHLMP would include:

- A description of the study’s purpose and objectives
- A description of methods to define Project-specific ZOIs (e.g., gradient analysis, nest density)
- A description of data requirements to establish Project-specific ZOIs and field programs that would be implemented (pre-construction and post-operation)
- A description of the duration of studies required to establish Project-specific ZOIs
- A description of criteria to be used to compensate for loss of habitat function and value
- An environmental effectiveness monitoring strategy of compensatory habitat to ensure that the habitat meets success criteria

The IHLMP would also include a series of compensatory site-selection criteria, developed in consultation with the PTAG. The selection criteria would be used to evaluate candidate habitat compensation habitats. Habitats that achieve more of the criteria would be identified as the preferential sites. Selection criteria would include, at a minimum:

- Proximity to the Lease Boundary (e.g., hierarchy of preferences with respect to location—within the Lease Boundary being the highest priority, adjacent to the Lease Boundary being the second highest priority, and off site being the third priority)

- Protection of existing native shrub-steppe or grassland habitats
- Encompassing sensitive or important wildlife habitat (e.g., mapped movement corridors, ferruginous hawk core habitat, HCAs, areas of high prey abundance)
- Proximity to Project infrastructure

Rationale: This mitigation measure avoids and reduces disturbance to wildlife (indirect habitat loss) while allowing for ongoing monitoring, adaptive management, and offsetting of potential Project-related impacts.

Hab-6: Final Design: The Applicant would work with EFSEC, with advice from the PTAG, on the development of the final Project layout and design, including the application of Applicant commitments and recommended mitigation measures.

Rationale: This mitigation measure avoids and reduces potential habitat loss and disturbance to wildlife (indirect habitat loss).

Hab-7: All roadways constructed for the Project during the construction and operation phases would be removed and restored during decommissioning. The Applicant would provide EFSEC with rationale and propose additional mitigation measures if roadways are not decommissioned post-operation.

Rationale: This mitigation measure restores habitat post-operation and reduces habitat loss.

Hab-8: The Applicant would be required to provide compensation habitat loss and alteration (indirect habitat loss) (See Hab-5, Veg-4) through one or more actions of land acquisition, onsite easement and restoration (excluding areas impacted by the Project such as temporary laydowns), and/or fee-based mitigation.

The Applicant would prioritize development of conservation easements (Option 1[36] in the Applicant's Draft Wildlife and Habitat Mitigation Plan) and would compensate for the remaining permanent and altered (indirect) impacts by providing money to WDFW, or a third party identified by WDFW, and agreed to by EFSEC, to purchase other lands suitable as in-kind and/or enhancement mitigation. The Applicant would provide EFSEC, for review and approval, with rationale for fee-based mitigation (Options 2 and 3 in the Applicant's Draft Wildlife and Habitat Mitigation Plan) including a description of how much compensatory habitat would be addressed through Option 1 (conservation easement) and rationale for why fee-based mitigation is required.

The fee-based mitigation includes a per acre fee that would be determined by market rates and land sales within the general vicinity of the Lease Boundary for lands containing comparable habitat types and quality present within the Lease Boundary. The per acre fee would be developed by the Applicant in consultation with WDFW and approved by EFSEC. The Total Financial Obligation (TFO) would be determined by multiplying the cost per acre by the total Compensatory Mitigation Acres (CMA) remaining after the application of Option 1 mitigation strategy and would include a one-time 15 percent premium to cover administration and management costs for the purchased lands. The TFO for compensatory mitigation would be determined and agreed to by EFSEC 90 days before construction. If construction has not begun within 12

[36] Applicant's Draft Wildlife and Habitat Mitigation Plan identifies three compensation options: Option 1 – Conservation easement within or adjacent to the Lease Boundary; Option 2 – Annual fee or lump sum payment provided to WDFW; Option 3 – payment to local land trusts, conservation organizations, or local tribes to support conservation projects.

months of the approval of the TFO, the TFO identified would expire and be recalculated prior to beginning construction. The TFO would be calculated based on the following:

Average Comparable Land Sale Cost (per acre)(CMA-Option 1 Acres)*1.15 = TFO*

In addition to the wildlife and habitat mitigation measures, the following measures developed for the Vegetation chapter are applicable to wildlife and habitat.

Rationale: This mitigation measure clarifies the process to be followed in selection of offsetting habitat.

Veg-1:[37] **Tree Avoidance:** Construction would avoid removing or disturbing trees within the Project Lease Boundary. Disturbance to trees includes any disturbance, including topping, within the drip-line of the tree (i.e., the area from the edge of the outermost branches), which preserves an intact root system. Disturbance within the drip-line of the tree should be avoided as this can lead to tree mortality. The avoidance area within the drip-line of trees in work areas should be delineated using snow fencing or a similar measure to improve the visibility of avoidance zones. Trees cannot be disturbed or removed without pre-approval. Where disturbance of trees by the Project cannot be avoided (e.g., near transmission lines), the number and location of the trees would be provided to EFSEC, along with a statement justifying why avoidance cannot be achieved, and a mitigation plan. The mitigation plan would include replanting trees within the Lease Boundary to maintain the diversity of habitat structures provided by trees and would require approval by EFSEC prior to proceeding. The mitigation measure avoids physical disturbance to trees, which provides structural diversity for wildlife habitat.

Veg-4: As-Built Report and Offset Calculation: Within 60 days of completing construction, the Applicant would provide an as-built report that documents the amount of temporary and permanent disturbance associated with the Project. This would include associated maps and georeferenced spatial files. The as-built report would be factored into the final calculation of habitat offset based on the Applicant-provided ratios. The acreages of modified habitat planted for the Project under the solar arrays would also be included in this report. EFSEC would determine the number of years that vegetation monitoring of temporary disturbance and modified habitat would be conducted and the success criteria for revegetation. The success criteria would include parameters that the Applicant would measure to determine whether successful revegetation has occurred.

The Applicant would submit annual reports for each year of vegetation monitoring following construction to document the success of revegetation. At the end of the vegetation monitoring period, as determined by EFSEC, areas of modified habitat and revegetated temporary disturbance that have met the success criteria would be eligible for offset by the Applicant at the respective ratios. Any areas of modified habitat or temporary disturbance that do not meet the success criteria after completion of revegetation monitoring would be considered permanent disturbance, and this would be added to the offset requirement.

Rationale: This mitigation measure addresses habitat offset by requiring a final calculation of offset requirements based on actual disturbance.

Veg-7: Detailed Site Restoration Plan: The Detailed Site Restoration Plan is a required, regulatory document. It would be prepared and submitted for approval by EFSEC for final revegetation prior to Project

[37] Veg-: Identifier of numbered mitigation item for Vegetation, as described in Section 4.5

decommissioning for the temporary and permanent disturbance areas. It would be adapted to include modified habitat.

Rationale: The Detailed Site Restoration Plan would be a living document. It would include the methods, success criteria, monitoring, and reporting for revegetation at the end of the Project life. It would also include provisions for adaptive management and would be prepared based on any lessons learned from implementing the revegetation planned for the temporary disturbance from Project construction as described in Appendix N of the 2022 ASC (Appendix N, Horse Heave Wind Farm, LLC 2022)..

Recommended Mitigation Measures for Special Status Species

Table 4.6-9 summarizes the mitigation measures recommended by EFSEC that are specific to special status species. These measures, in combination with those described above, would reduce potential Project-related impacts on these species.

Table 4.6-9: Recommended Mitigation Measures for Special Status Species

Mitigation Identifier	Species Name	Species-specific Mitigation
Spec-1[38]	Striped whipsnake Sagebrush lizard	The Applicant would conduct pre-construction surveys for sensitive reptile species prior to alteration or destruction of suitable habitat, such as areas within the Lease Boundary identified as core habitat in GAP mapping, as well as shrubland (e.g., shrub-steppe, rabbitbrush). WDFW would be contacted prior to undertaking these surveys. If these species are identified through pre-construction surveys, the Applicant would prepare a Reptile Management Plan to reduce potential impacts on habitat, mortality, and barriers to movement. The Reptile Management Plan would describe: ▪ How the Applicant would avoid suitable habitat, including where the species were observed ▪ How the Applicant would implement management recommendations in Larsen (1997) ▪ How the Applicant would maintain rodent burrows in suitable reptile habitat (e.g., shrub-steppe) ▪ Additional mitigation measures to reduce potential mortality of these species during the Construction and Operation Stages of the Project The Reptile Management Plan would be reviewed by the PTAG and approved by EFSEC prior to initiation of construction. Survey results and proposed adaptive management would be reviewed by the PTAG and approved by EFSEC prior to implementation (see Hab-4). **Rationale:** This mitigation measure avoids and reduces potential striped whipsnake and sagebrush lizard habitat loss and mortality while allowing for adaptive management throughout Project construction and operation.
Spec-2	American white pelican	The Applicant would maintain a database of American white pelican observations within the Project Lease Boundary. Observational data would be reviewed with the TAC annually, and additional survey strategies would be applied as needed to inform adaptive management. **Rationale:** This mitigation measure allows for adaptive management of potential American white pelican mortality throughout Project operation.
Spec-3	Eagles	The Applicant would obtain any required federal approvals. The Applicant would continue ongoing coordination with the USFWS (Eagle Coordinator, Columbia Pacific Northwest Region) regarding an eagle take permit for incidental take of bald and golden eagles and would continue to evaluate eagle risk to determine if an eagle take permit is appropriate considering the use of the Project by bald and golden eagles. The Applicant would apply WDFW-recommended buffers for bald eagle and golden eagle nests (Larsen et al. 2004): ▪ Bald eagle protected zone (400 feet) and conditioned zone (up to 800 feet beyond the protected zone) ▪ Golden eagle – 1.9 miles **Rationale:** This mitigation measure avoids and reduces potential disturbance of eagle nests and eagle mortality.

[38] Spec-: Identifier of numbered mitigation item for Special Status Species, as described in Section 4.5

Table 4.6-9: Recommended Mitigation Measures for Special Status Species

Mitigation Identifier	Species Name	Species-specific Mitigation
Spec-4	Burrowing owl	The Applicant would conduct burrowing owl surveys within areas of direct loss (permanent, temporary, and modified) and associated ZOIs. The results of these surveys would be provided to the PTAG and EFSEC and used to inform the final Project layout. Active burrows would be retained, and satellite burrows with characteristics used by burrowing owls would be avoided where feasible to maintain habitat capacity. WDFW-recommended seasonal buffers (0.5 miles) would be applied around burrowing owl nests to avoid disturbing nesting burrowing owls, if present (Larsen et al. 2004). Seasonal buffers (February 15 to September 25) would be applied during construction and for temporary disturbances, such as periodic maintenance, during operation. If active burrowing owls are identified within the Lease Boundary, the Applicant would develop a species-specific management plan that describes: ▪ The location of active burrows ▪ How active burrows would be avoided through re-alignment or reconfiguration of Project features ▪ Additional mitigation measures that would be applied where disturbance to active burrows is expected (e.g., construction of artificial burrows) ▪ Additional mitigation measures that would be applied during operation if burrowing owl mortalities are recorded. ▪ How ongoing monitoring of active burrows would be undertaken The Burrowing Owl Management Plan would be reviewed by the PTAG and approved by EFSEC prior to initiation of construction. Survey results and proposed adaptive management would be reviewed by the PTAG and approved by EFSSEC prior to implementation (see Hab-4). The Applicant would monitor access roads for burrowing owl use and mortalities. Mortalities would be reported to the PTAG or TAC (depending on the Project phase) and EFSEC within 5 days of the observation. Incidental observations of burrowing owl use would be provided to the PTAG (construction) or TAC (operation) on an annual basis. **Rationale:** This mitigation measure avoids and reduces potential loss of burrowing owl habitat, disturbance to burrowing owls, and burrowing owl mortality, while allowing for adaptive management throughout Project construction and operation.
Spec-5	Ferruginous hawk	The Applicant would avoid siting Project components within core habitat in ferruginous hawk territories, defined as the habitat within a 2-mile radius surrounding ferruginous hawk nests documented in PHS data and in Horse Heaven Wind Farm, LLC (2022). Siting of features within 2 miles of a known ferruginous hawk nest may be considered if the Applicant is able to demonstrate that the nest site and foraging habitat is no longer available to the species and that compensation habitat, as described below, would provide a net gain in ferruginous hawk habitat. Habitat considered no longer available for ferruginous hawk would include habitat that has been altered by landscape-scale development (cropland conversion, residential development, industrial development) rendering the territory non-viable. This could include habitats that have been altered such that no native or foraging habitat remains and no nesting structures exist. Project infrastructure would not be sited within 2 miles

Table 4.6-9: Recommended Mitigation Measures for Special Status Species

<table>
<tr><th>Mitigation Identifier</th><th>Species Name</th><th>Species-specific Mitigation</th></tr>
<tr><td></td><td></td><td>of a ferruginous hawk nest without prior approval by EFSEC based on the process described below.

The extent of encroachment into 2-mile core habitat may vary depending on the type of infrastructure proposed (e.g., turbine, power line, road). If encroachment is considered by the Applicant, the Applicant would provide the PTAG and EFSEC with:
1. A set of habitat parameters, developed in consultation with the PTAG for approval by EFSEC, to document whether habitat in a core range is consider non-viable. The results of habitat surveys would be reviewed by the PTAG and approved by EFSEC.
2. A description of the current nesting habitat available and a description of documented use of the core habitat by ferruginous hawk available through historic background information or field-based surveys.
3. A description of the type and location of infrastructure proposed within the core habitat.
4. The proximity of infrastructure to any known nest site or suitable foraging habitat.

In the event that a Project component is proposed for siting within the 2-mile buffer, the Applicant would, in consultation with the PTAG for approval by EFSEC, develop a Project-specific ferruginous hawk mitigation and management plan:
1. A description of efforts to site Project infrastructure to avoid core habitat, identified as the area within 2 miles of nests documented in PHS data and Horse Heaven Wind Farm, LLC (2022):
a. If Project components are sited within 2 miles of a ferruginous hawk nest, the infrastructure would be reviewed by the PTAG and approved by EFSEC.
b. Additional mitigation measures would be developed to reduce potential ferruginous hawk strikes with turbines, including curtailing turbine operation within the 2-mile core habitat of any actively occupied nests during the breeding and rearing periods when ferruginous hawks are present in Benton County.
c. The plan would explain how and where the Applicant would create offsetting habitat for direct and indirect habitat loss within the 2-mile core habitat of ferruginous hawk nests documented in PHS data and in Horse Heaven Wind, LLC (2022).
2. A description of when construction activities would be undertaken to avoid sensitive timing periods for ferruginous hawk.
3. A description of pre- and post-monitoring programs that would be conducted to establish:
a. Habitat use within the Lease Boundary.
b. Mapping of ground squirrel colonies and other prey items.
c. Identification of potential flyways between nest sites and foraging habitat and monitoring of potential flyways to inform final turbine siting and orientation.
d. Ongoing monitoring of nest use and territory success.</td></tr>
</table>

Table 4.6-9: Recommended Mitigation Measures for Special Status Species

Mitigation Identifier	Species Name	Species-specific Mitigation
		4. A description of restoration activities that would be undertaken in disturbed areas to enhance ferruginous hawk habitat during Project decommissioning. Results of ferruginous hawk monitoring programs and adaptive management would continue through Project operation and decommissioning with review by the TAC and approval by EFSEC. **Rationale:** This mitigation measure avoids and reduces potential loss of ferruginous hawk habitat, disturbance to ferruginous hawk, and ferruginous hawk mortality, while allowing for adaptive management throughout Project construction and operation.
Spec-6	Great blue heron Sandhill crane Tundra swan	The Applicant would maintain a database of incidental observation of great blue heron, sandhill crane, and tundra swan foraging within the Lease Boundary during operation. Observational data and proposed adaptive management strategies would be reviewed with the TAC annually (see Hab-4). The Applicant would reduce the use of overhead power lines, where possible. The Applicant would apply buffers recommended in Larsen et al. (2004)[(a)] for sandhill crane feeding areas (0.5 miles) and roosting areas (0.3 miles), if documented within the Lease Boundary. **Rationale:** This mitigation measure avoids and reduces potential disturbance and mortality of great blue heron, sandhill crane and tundra swan, while allowing for adaptive management throughout Project construction and operation.
Spec-7	Loggerhead shrike Sagebrush sparrow Sage thrasher Vaux's swift	The Applicant would maintain connectivity between natural habitat patches to reduce potential habitat loss and fragmentation. The Applicant would restore areas with shrubs, where feasible, to reduce potential habitat loss. The Applicant would avoid the use of insecticides and herbicides to reduce potential mortality and loss of prey items. The Applicant would retain trees, shrubs, and hedgerows, as feasible, to reduce habitat loss. The Applicant would consult with the PTAG and TAC and EFSEC if suitable habitat for loggerhead shrike, sagebrush sparrow, and sage thrasher cannot be avoided. If suitable habitat cannot be avoided, the Applicant would, in consultation with the PTAG for approval by EFSEC, develop nest setback buffers that are supported by literature to be applied during clearing and grubbing activities. The Applicant would avoid clearing and grubbing during the active nesting period to reduce potential destruction of active nests and disturbance of nesting birds. If clearing and grubbing occurs during the nesting season, the Applicant would conduct pre-clearing surveys for active nests and maintain appropriate setback buffers around active nests. Observational data and proposed adaptive management strategies would be reviewed with the TAC annually (see Hab-4). **Rationale:** This mitigation measure avoids and reduces potential habitat loss, habitat fragmentation, and mortality to avoid and reduce impacts on loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift. The measure allows for adaptive management throughout Project construction and operation.

Table 4.6-9: Recommended Mitigation Measures for Special Status Species

Mitigation Identifier	Species Name	Species-specific Mitigation
Spec-8	Prairie falcon	The Applicant would conduct pre-construction surveys for prairie falcon nests for construction work proposed during the prairie falcon nesting season and maintain a seasonal buffer of 2,640 feet from active nest sites (Larsen et al. 2004) to reduce potential destruction or disturbance of active nests. Observational data and proposed adaptive management strategies would be reviewed with the TAC annually (see Hab-4). **Rationale:** This mitigation measure avoids and reduces potential disturbance to prairie falcon, and prairie falcon mortality, while allowing for adaptive management throughout Project construction and operation.
Spec-9	Ring-necked pheasant	The Applicant would consider using native grasses and legumes that support ring-necked pheasant in seed mixes applied during post-construction restoration of temporary disturbances and decommissioning to reduce potential habitat loss (Larsen et al. 2004). Observational data and proposed adaptive management strategies would be reviewed with the TAC annually (see Hab-4). **Rationale:** This mitigation measure reduces potential loss of ring-necked pheasant habitat and allows for adaptive management throughout Project construction and operation.
Spec-10	Black-tailed jackrabbit White-tailed jackrabbit	The Applicant would conduct surveys for jackrabbit in suitable habitat identified through GAP predictive mapping. If jackrabbits are identified, the Applicant would develop and implement a management plan with additional mitigation measures to reduce potential loss of habitat supporting jackrabbits. Observational data and proposed adaptive management strategies would be reviewed with the TAC annually (see Hab-4). **Rationale:** This mitigation measure reduces potential loss of black-tailed and white-tailed jackrabbit habitat, indirect habitat loss, habitat fragmentation, and mortality, while allowing for adaptive management throughout Project construction and operation.
Spec-11	Townsend’s big-eared bat	The Applicant would restrict bat access to open water if the water could be contaminated. The Applicant would retain old buildings, outbuildings, and trees where feasible. The Applicant would report mortalities of Townsend’s big-eared bat to EFSEC and the TAC. Bat mortality data and adaptive management strategies would be reviewed with the TAC annually (see Hab-4). **Rationale:** This mitigation measure reduces potential loss of Townsend’s big-eared bat habitat and mortality and allows for adaptive management throughout Project construction and operation.

Table 4.6-9: Recommended Mitigation Measures for Special Status Species

Mitigation Identifier	Species Name	Species-specific Mitigation
Spec-12	Townsend's ground squirrel	The Applicant would conduct surveys for Townsend's ground squirrel colonies within the Lease Boundary in areas of the Project disturbance footprint (including ZOI) to inform final design. The Applicant would avoid habitat loss within Townsend's ground squirrel habitat concentration areas, as well as known colonies, in final design. Additional Townsend's ground squirrel colonies identified through surveys would be shown on Project mapping. If Project components are required in habitat concentration areas (rated as medium or greater) or near known colonies, the Applicant would prepare a species-specific management plan for areas where avoidance is not feasible. This plan would provide rationale for why colonies cannot be avoided and would detail additional mitigation measures to reduce impacts to Townsend's ground squirrel. Additional mitigation measures may include identification of setbacks, colony monitoring, habitat restoration, colony relocation, and reconstruction of habitat features. The plan would also describe monitoring and adaptive management measures to be implemented during Project operation. The plans would be provided and discussed with the PTAG, and approved by EFSEC, if avoidance of identified ground squirrel colonies is not feasible. Observational data and adaptive management strategies would be reviewed with the TAC annually. **Rationale:** This mitigation measure reduces potential loss of Townsend's ground squirrel habitat, disturbance of squirrel colonies, and Townsend's ground squirrel mortality, while allowing for adaptive management throughout Project construction and operation.
Spec-13	Pronghorn antelope	The Applicant would limit fencing where feasible (e.g., around solar arrays). Final fencing layouts and design, including use of non-barbed-wire security fencing, would be provided to the PTAG and EFSEC with rationale for fencing requirements. The Applicant would design and implement a study of seasonal pronghorn antelope occurrence and use of the Lease Boundary before construction and during operation to document the change, if any, of pronghorn antelope presence, abundance, and habitat use within the Lease Boundary. The PTAG would review and provide input to the study design. The results of the study would be used to develop adaptive management measures to respond to changes in pronghorn antelope habitat use. Survey results and proposed adaptive management would be reviewed by the TAC prior to implementation (see Hab-4). The Applicant would maintain a database of pronghorn antelope observations, including details such as numbers, location, age, and sex, and would make this database available to WDFW, EFSEC, and the Yakama Nation. **Rationale:** This mitigation measure reduces potential disturbance to pronghorn antelope and barriers to pronghorn antelope movement, while allowing for adaptive management throughout Project construction and operation.

Notes :
[a] Larsen et al. (2004) recommend buffers around great blue heron colonies, which do not occur within the Lease Boundary, and do not provide recommended buffers for tundra swan.
ASC = Application for Site Certification; EFSEC = Washington Energy Facility Site Evaluation Council; GAP = Gap Analysis Project; PHS = Priority Habitats and Species; PTAG = Pre-operational Technical Advisory Group; TAC = Technical Advisory Committee; USFWS = U.S. Fish and Wildlife Service; WDFW = Washington Department of Fish and Wildlife; ZOI = zone of influence

Summary of Milestones and Timing

Table 4.6-10 summarizes wildlife and habitat mitigation milestones and the timing of when milestones would be met.

Table 4.6-10: Summary of Milestones

Timing	Mitigation Measure	Milestone	PTAG/TAC review
Construction			
One year prior to construction	**Hab-4**	Establishment of Pre-operational Technical Advisory Group (PTAG will be replaced by the Technical Advisory Committee upon the onset of operation).	NA
During appropriate season within 1 year prior to construction	**Spec-1, 4, 8, 10, 12**	Pre-construction surveys	PTAG
180 days prior to construction	**Hab-6**	Final design	PTAG
90 days prior to construction	**Hab-1**	Corridor Mitigation Plan, if necessary	PTAG/ TAC
90 days prior to construction	**Hab-2**	Rationale for and mitigation of canyon and draw crossings	NA
90 days prior to construction	**Wild-8**	Raptor Nest Monitoring and Management Plan	PTAG
90 days prior to construction	**Hab-5**	Indirect Habitat Loss Management Plan	PTAG
90 days prior to construction, if needed	**Spec-5**	Ferruginous hawk Mitigation and Management Plan	PTAG/TAC
60 days prior to initiation of surveys (pre-construction).	**Spec-13**	Pronghorn antelope seasonal study	PTAG/TAC
60 days prior to construction, if needed	**Spec-1, 4, 10, 12**	Species-specific management plans	PTAG/ TAC
Prior to construction	**Wild-5**	Flagging sensitive features and habitat	NA
Prior to construction	**Wild-9**	Pre-construction bird nest surveys, if necessary	NA
Operation			
60 days post-construction	**Veg-4**	As-built report and offset calculation	NA
Two years after commencement of operation	**Wild-1**	Review of post-construction fatality monitoring results	PTAG/ TAC
Annually during operation	**Wild-6**	Review mortality database and provide mitigation	NA
Annually during operation	**Spec-2, 4, 6, 7, 8, 9, 12**	Incidental databases	TAC
Annually during operation	**Spec-11**	Townsend’s big-eared bat mortality database	TAC

Timing	Mitigation Measure	Milestone	PTAG/TAC review
Decommissioning			
60 days prior to initiation of decommissioning	**Veg-7**	Detailed Site Restoration Plan	NA
60 days prior to initiation of decommissioning	**Hab-7**	Rationale for and mitigation of remaining roadways, if any	NA

4.6.2.6 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the expected changes that the Applicant was making to the Project in response to comments received on the EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include undergrounding of transmission lines where applicable

- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[39]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

A summary of the change in direct habitat loss associated with the updated East Solar Array based on the new fence alignment provided in the Applicant's response to Data Request 9 is provided under the Vegetation Chapter (Table 4.5-12). In general, the overall size of the solar arrays in the East Solar Siting Area has been reduced by approximately 1,355 ha; however, impacts to Priority Habitat remain similar as the original solar array design. The revised solar array fence alignment no longer overlaps areas rated as a moderate movement corridor by the Washington Wildlife Habitat Connectivity Working Group. As such, the magnitude rating for impacts to general wildlife barriers to movement from solar arrays during Project Operation has been reduced from Medium to Low.

The revised Applicant commitments also included removing 15 turbines previously sited in core ferruginous hawk territory (e.g., 3.2 miles from a documented nest). While this change reduces the loss of habitat in core ferruginous hawk range and reduces the risk of mortality, 116 turbines remain in core ferruginous hawk range, as such impact ratings for ferruginous hawk remain unchanged.

Considering the post-adjudication Applicant commitments and other changes provided in the 2022 ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for wildlife and habitat in the Draft EIS, with the exception described above for barriers to general wildlife movement.

4.6.2.7 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depends on the magnitude and duration of an impact. "Significant" in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This EIS weighs the impacts on wildlife and habitat that may result from the Proposed Action with mitigation measures, and makes a resulting determination of significance for each impact in **Tables 4.6-11a, 4.6-11b, and 4.6-11c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to wildlife and habitat.

[39] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Habitat Loss	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The Project would result in the direct loss of habitat through construction of the Wind Energy Micrositing Corridor and associated transportation routes. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.	Medium	Short Term for temporary disturbances (e.g., construction laydown areas) Constant for permanent footprint loss (e.g., turbine footprint)	Unavoidable	Local	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance.	None identified
Habitat Loss	Solar Arrays	The Project would result in the direct loss of habitat, including modified habitat, through construction of the solar arrays and associated transportation routes. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.	Medium	Short Term for temporary disturbances (e.g., construction laydown areas) and modified habitat under the solar fields Constant for permanent footprint loss.	Unavoidable	Confined	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance.	None identified
Habitat Loss	BESS Substations	The Project would result in the direct loss of habitat through construction of the BESS, substations, and associated transportation routes. The Project may also result in indirect habitat loss through increased noise, light, and human presence during construction.	Low	Short Term for temporary disturbances (e.g., construction laydown areas) Long Term for permanent footprint loss.	Unavoidable	Limited	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Mortality of non-special status species	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The Project may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) during clearing and ground preparation works. Wildlife-vehicle collisions may occur during Project construction due to increased traffic.	Low	Short Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** schedule construction during daylight hours. **Wild-8:** Establish buffers around raptor nests. **Wild-9:** Time vegetation clearing outside of nesting season and provide mitigation for nesting birds. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design.	None identified
Mortality of non-special status species	Solar Arrays	The Project may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) during clearing and ground preparation works. Wildlife-vehicle collisions may occur during Project construction due to increased traffic.	Low	Short Term	Feasible	Limited	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule construction during daylight hours. **Wild-8:** Establish buffers around raptor nests. **Wild-9:** Time vegetation clearing to avoid nesting season and mitigation of nesting birds. **Hab-4:** Develop TAC.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Mortality of non-special status species	BESS Substations	The Project may result in mortality of smaller animals (e.g., birds, herptiles, small mammals) during clearing and ground preparation works. Wildlife-vehicle collisions may occur during Project construction due to increased traffic.	Negligible	Short Term	Feasible	Limited	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule construction during daylight hours. **Wild-8:** Establish buffers around raptor nests. **Wild-9:** Time vegetation clearing outside of nesting season and provide mitigation for nesting birds. **Hab-4:** Develop TAC.	None identified
Barriers to movement and fragmentation	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Turbines, power lines, roadways, and other linear infrastructure could create barriers to wildlife movement and fragment habitat. Barriers and fragmentation created during construction would predominantly remain through operation.	Low	Long Term	Probable	Confined	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3**: Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design.	None identified
Barriers to movement and fragmentation	Solar Arrays	Solar arrays may impact wildlife movement and fragment habitat by bisecting movement corridors. Solar arrays would be fenced, which is expected to create a barrier to movement of larger wildlife around the arrays.	Low	Long Term	Unavoidable	Confined	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3**: Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Barriers to movement and fragmentation	BESS Substations	BESS and substations may create barriers to wildlife movement in the adjacent area.	Negligible	Long Term	Unavoidable	Limited	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3**: Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design.	None identified
Special status species: striped whipsnake and sagebrush lizard	Turbine Option 1 Turbine Option 2 Solar Array BESS Substations **Comprehensive Project**	Impacts on shrub and shrub-steppe habitat may result in loss of suitable reptile habitat. Mortality of reptile species could occur during construction from heavy machinery and land clearing and grubbing.	Low	Constant	Feasible	Confined	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6**: Maintain database of road mortalities. **Hab-3**: Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-1:** Implement striped whipsnake and sagebrush lizard specific mitigation.	None identified
Special status species: American white pelican	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project may disturb American white pelicans moving over the Lease Boundary.	Negligible	Short Term	Unlikely	Limited	**Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Spec-2:** Implement American white pelican specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: bald eagle	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project could disturb bald eagles, resulting in avoidance of the Project Site.	Negligible	Short Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction. disturbance by identifying sensitive areas. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Veg-1:** Tree avoidance. **Spec-3:** Implement eagle specific mitigation.	None identified
Special status species: burrowing owl	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction may result in direct and indirect habitat loss and the destruction of burrows (active, inactive, and potential). Mortality may occur during vegetation and ground-disturbing works.	Medium	Constant (habitat loss) Short Term (disturbance, mortality)	Unavoidable (habitat loss) Probable (disturbance) Feasible (mortality)	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule construction during daylight hours. **Wild-8:** Establish buffers around raptor nests. **Wild-9:** Time vegetation clearing outside of nesting season and provide mitigation for nesting birds. **Hab-3:** Temporary laydown areas **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-4:** Implement burrowing owl specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: ferruginous hawk	Turbine Option 1 Turbine Option 2 BESS Substations **Comprehensive Project**	Construction of turbines and associated roads and power lines may result in the direct and indirect loss of habitat in core and range ferruginous hawk habitat. Nesting success could be impacted by construction activities near the nest or activities change prey abundance.	High	Constant (habitat loss) Short Term (disturbance)	Unavoidable (habitat loss) Probable (disturbance)	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-5**: Implement ferruginous hawk specific mitigation.	None identified
Special status species: ferruginous hawk	Solar Arrays	Three historic nesting locations would be directly impacted at the East Solar Field.	Medium	Constant	Unavoidable	Limited	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-5:** Implement ferruginous hawk specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: golden eagle	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project could disturb golden eagles, resulting in avoidance of the Project site, though golden eagle nesting has not been reported within 10 miles of the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance. **Spec-3:** Implement eagle specific mitigation.	None identified
Special status species: great blue heron and sandhill crane	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction may disturb birds flying over the Lease Boundary, resulting in bird flight paths being diverted around the area. Construction may result in the loss of foraging habitat.	Negligible	Long Term (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Feasible (disturbance, mortality)	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: loggerhead shrike	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction may result in direct and indirect (disturbance) habitat loss. Mortality may occur from interactions with machinery and destruction of nests.	Low	Constant (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Probable (disturbance, mortality)	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule construction during daylight hours. **Wild-9:** Time vegetation clearing outside of nesting season and provide mitigation for nesting birds. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on Final Project layout and design. **Hab-8:** Mitigation options **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: prairie falcon	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project is predicted to result in the direct loss of suitable foraging habitat for prairie falcon. Disturbance from construction activities may result in disturbance to prairie falcons.	Medium	Constant (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Probable (disturbance, mortality)	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance. **Spec-8**: Implement prairie falcon specific mitigation.	None identified
Special status species: ring-necked pheasant	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project is predicted to result in the direct loss of suitable foraging habitat for ring-necked pheasant. Disturbance from construction activities may result in indirect habitat loss. Access roads may result in collisions with ring-necked pheasants.	Low	Long Term (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Probable (disturbance, mortality)	Confined	**Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-9:** Time vegetation clearing outside of nesting season and provide mitigation for nesting birds. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-9:** Implement ring-necked pheasant specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: sagebrush sparrow sage thrasher	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction may result in direct and indirect habitat loss. Mortality may occur from interactions with machinery and destruction of nests.	Low	Constant (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Probable (disturbance, mortality)	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule construction during daylight hours **Wild-9:** Time vegetation clearing outside of nesting season and provide mitigation for nesting birds. **Hab-2:** Minimize transmission line crossings. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified
Special status species: tundra swan	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction may result in the disturbance and loss of suitable foraging habitat and disruption of birds flying over the Lease Boundary.	Low	Long Term (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Feasible (disturbance, mortality)	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: Vaux's swift	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project could disturb Vaux's swift in flight over the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: black-tailed jackrabbit white-tailed jackrabbit	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project is predicted to result in the direct loss of suitable habitat for jackrabbit. Disturbance from construction activities may result in indirect habitat loss. Access roads may result in collisions with jackrabbits, barriers to movement, and increased fragmentation.	Low	Constant (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Probable (disturbance, mortality)	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-3**: Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-10:** Implement black and white-tailed jackrabbit specific mitigation.	None identified
Special status species: Townsend's big-eared bat	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction activities could disturb Townsend's big-eared bat foraging within the Lease Boundary.	Negligible	Short Term	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-7:** Schedule construction during daylight hours. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-11:** Implement Townsend's big-eared bat specific mitigation.	None identified
Special status species: Townsend's ground squirrel	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction of the Project and associated access roads are predicted to result in the loss of suitable Townsend's ground squirrel habitat and destruction of colonies. Mortality may occur during construction work near colonies and along access roads.	Medium	Constant (habitat loss) Short Term (construction disturbance, construction mortality)	Unavoidable (habitat loss) Probable (disturbance, mortality)	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-12:** Implement Townsend's ground squirrel specific mitigation.	None identified

Table 4.6-11a: Summary of Potential Impacts on Wildlife and Habitat during Construction of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: pronghorn antelope	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Construction is predicted to result in direct loss of pronghorn antelope habitat. Activity associated with construction may result in indirect habitat loss. Increased traffic on existing and new access roads may result in pronghorn antelope mortality.	Medium	Constant (habitat loss) Short Term (construction disturbance)	Unavoidable (habitat loss) Probable (disturbance)	Confined	**Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-3:** Temporary laydown areas. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Spec-13:** Implement pronghorn antelope specific mitigation.	None identified

Notes:
(a) The impacts related to each component including “comprehensive Project” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; TAC = Technical Advisory Committee; USFWS = U.S. Fish and Wildlife Service; ZOI = zone of influence

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Habitat loss	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The Project would result in the direct loss of habitat through operation of the turbines and associated infrastructure. The Project may result in indirect habitat loss through degradation of habitat in ZOI created by disturbances (e.g., noise, light) from turbines and associated infrastructure.	Medium	Constant	Unavoidable	Local	**Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance. **Veg-4:** As-built report and offset calculation.	None identified
Habitat loss	Solar Arrays	The Project would result in the direct loss of habitat through operation of the solar arrays and associated infrastructure. The Project may result in indirect habitat loss through degradation of habitat in ZOI created by disturbances from solar arrays and associated infrastructure.	Medium	Constant	Unavoidable	Confined	**Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance. **Veg-4:** As-built report and offset calculation.	None identified
Habitat Loss	BESS Substations	The Project would result in the direct loss of habitat through operation of the BESS and substations. The operation of the BESS and substations may also result in indirect habitat loss through degradation of habitat in the 0.5-mile ZOI created by disturbances from these features.	Negligible	Long Term	Unavoidable	Limited	**Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-1:** Tree Avoidance. **Veg-4:** As-built report and offset calculation.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Mortality of non-special status species	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The Project may result in mortality of aerial species (birds and bats) through collisions with turbines, strikes with power lines, windows, and weather towers. Other sources of mortality on wildlife, including non-aerial species, include vehicle collisions and changes in food availability.	Medium	Long Term	Probable	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-6:** Work with EFSEC on final Project layout and design.	None identified
Mortality of non-special status species	Solar Arrays	Bird species, particularly water-associated species, may collide with solar arrays. Mortality of other species, such as herptile, could occur depending on conditions under the solar facilities.	Low	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC.	None identified
Mortality of non-special status species	BESS Substations	Wildlife mortality may occur due to collisions with infrastructure, including BESS and substations.	Negligible	Long Term	Unlikely	Limited	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Barriers to movement and fragmentation	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The operation of turbines, power lines, roadways, and other linear infrastructure could result in barriers to wildlife movement and fragment habitat. Barriers and fragmentation created during construction would predominantly remain through operation.	Low	Long Term	Probable	Confined	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Veg-4:** As-built report and offset calculation.	None identified
Barriers to movement and fragmentation	Solar arrays	The east solar field is situated on a movement corridor and may impact wildlife movement. Fencing around solar arrays is expected to create barriers for larger mammals. Herptiles, small mammals, and small birds are expected to be able to continue to access vegetation around the arrays through the fencing.	Low[e]	Long Term	Probable	Confined	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Veg-4:** As-built report and offset calculation.	None identified
Barriers to movement and fragmentation	BESS Substations	BESS and substations may create barriers to wildlife movement in the adjacent area.	Low	Long Term	Feasible	Limited	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Veg-4:** As-built report and offset calculation.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: Striped whipsnake and sagebrush lizard	Turbine Option 1 Turbine Option 2 Solar Array BESS Substations **Comprehensive Project**	Impacts on shrub and shrub-steppe habitat may result in loss of suitable reptile habitat. Increased road networks within the Lease Boundary could increase the risk of mortality sagebrush lizard and striped whipsnake. Roadways may create barriers to reptile movement and further fragment reptile habitat.	Low	Constant	Feasible	Confined	**Wild-6**: Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-1:** Implement striped whipsnake and sagebrush lizard specific mitigation.	None identified
Special status species: American white pelican	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	American white pelicans have the potential for collision with turbines, and electrocution with overhead transmission lines. American white pelicans could collide with solar arrays as literature suggests water-associated birds may attempt to land on solar arrays if they are mistaken for water (lake effect).	Medium	Long Term	Unlikely	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI.**Spec-2**: Implement American white pelican specific mitigation.	None identified
Special status species: American white pelican	BESS Substations	Interactions with BESS and substations are not expected.	Negligible	Long Term	Unlikely	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-2:** Implement American white pelican specific mitigation.	None identified
Special status species: bald eagle	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Bald eagles are estimated to be the 17th most likely large bird to collide with the turbines, with an estimated exposure index of 0.01. Further, turbines could create barriers to bald eagle movement over the Lease Boundary.	Low	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Spec-3:** Implement eagle specific mitigation.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: bald eagle	Solar Arrays BESS Substations	Solar arrays, BESS, substations, and other ground-based disturbances could reduce foraging habitat for bald eagles, though the Lease Boundary is not expected to provide key or important bald eagle habitat.	Negligible	Long Term	Feasible	Limited	**Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Spec-3:** Implement eagle specific mitigation.	None identified
Special status species: burrowing owl	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Permanent habitat loss from turbine footprint and roads would persist throughout operation. Operation of turbines could result in indirect burrowing owl habitat loss. Burrowing owls are not expected to collide with turbines but are susceptible to road-based mortality. Further, changes in prey distribution and abundance may change foraging.	Medium	Constant	Unavoidable	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation **Spec-4:** Implement burrowing owl specific mitigation.	None identified

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Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: burrowing owl	Solar Arrays BESS Substations	Areas under solar arrays may continue to provide habitat for burrowing owls, depending on conditions under the arrays. Habitat altered by the BESS and substations would be lost throughout operation. Increased traffic on roads used to access solar arrays, BESS, and substructures may result in burrowing owl mortality.	Medium	Constant	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-4**: Implement burrowing owl specific mitigation.	None identified
Special status species: ferruginous hawk	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Operation of the turbines could result in mortality due to collisions with turbines and power lines. Change in prey abundance may reduce hawk survivorship. Operation may also reduce the re-occupancy of nesting territories due to disturbance. Foraging habitat initially lost during construction would persist through operation	High	Constant	Unavoidable	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-5:** Implement ferruginous hawk specific mitigation.	None identified

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Special status species: ferruginous hawk	Solar arrays	Solar arrays may change prey structures, resulting in impacts on adult and young survivorship. Foraging habitat initially lost during construction would persist through operation	Medium	Constant	unavoidable	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-5:** Implement ferruginous hawk specific mitigation.	None identified
Special status species: ferruginous hawk	BESS Substations	Operation of the BESS and substations may result in loss of potential foraging habitat for ferruginous hawk.	Negligible	Constant	Unavoidable	Limited	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-5:** Implement ferruginous hawk specific mitigation.	None identified

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Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: golden eagle	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Golden eagles are estimated to be the 22nd most likely large bird to collide with the turbines. Further, turbines could create barriers to golden eagle movement over the Lease Boundary.	Medium	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-8:** Mitigation options **Spec-3:** Implement eagle specific mitigation.	None identified
Special status species: golden eagle	Solar Arrays BESS Substations	Solar arrays, BESS, substations, and other ground-based disturbances could reduce foraging habitat for golden eagles, though the Lease Boundary is not expected to provide key or important golden eagle habitat.	Negligible	Long Term	Unavoidable	Confined	**Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-8:** Mitigation options **Spec-3:** Implement eagle specific mitigation.	None identified
Special status species: great blue heron and sandhill crane	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The operation of wind turbines may result in great blue heron and sandhill crane mortality and disturbance.	Medium	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified

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Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: great blue heron and sandhill crane	Solar Arrays BESS Substations	Habitat loss during construction to accommodate the solar arrays, BESS, and substations would continue through operation.	Negligible	Long Term	Unavoidable	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: loggerhead shrike	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Direct and indirect habitat loss would persist throughout Project operation. Loggerhead shrike mortality may occur due to strikes with turbines.	Medium	Constant	Unavoidable	Confined	**Wild-4**: Avoid use of pesticides and rodenticides. **Wild-6**: Maintain database of road mortalities. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

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Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: loggerhead shrike	Solar Arrays	Direct and indirect habitat loss would persist throughout Project operation.	Low	Constant	Unavoidable	Confined	**Wild-4**: Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified
Special status species: loggerhead shrike	BESS Substations	Direct and indirect habitat loss would persist throughout Project operation.	Negligible	Constant	Unavoidable	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

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Special status species: prairie falcon	Turbine Option 1 Turbine Option 2 **Comprehensive Projec**t	Direct habitat loss would persist throughout Project operation. Operation of the turbines may disturb prairie falcons foraging within the Lease Boundary. Operation of the turbines may result in mortality of prairie falcons. Changes in prey density may change habitat suitability and survivorship of prairie falcons.	Medium	Constant	Unavoidable	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-8:** Implement prairie falcon specific mitigation.	None identified
Special status species: prairie falcon	Solar Arrays	Solar arrays may change prey dynamics within the Lease Boundary (e.g., sheltering under arrays), thereby reducing habitat suitability and survivorship of prairie falcons.	Low	Constant	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation **Spec-8:** Implement prairie falcon specific mitigation.	None identified

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Special status species: prairie falcon	BESS Substations	Direct habitat loss at the BESS and substations would persist throughout operation.	Negligible	Constant	Unavoidable	Limited	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-8:** Implement prairie falcon specific mitigation.	None identified
Special status species: ring-necked pheasant	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Direct habitat loss would persist through Operation. Operation of the turbines may also result in indirect habitat loss. Ring-necked pheasant mortality may occur due to Project operation. Access roads may result in collisions with ring-necked pheasants.	Low	Long Term	Unavoidable	Confined	**Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-8:** Mitigation options **Spec-9:** Implement ring-necked pheasant specific mitigation.	None identified
Special status species: ring-necked pheasant	Solar arrays BESS Substations	Direct habitat loss would persist throughout operation. Access roads may result in collisions with ring-necked pheasants.	Negligible	Long Term	Unavoidable	Confined	**Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-8:** Mitigation options **Spec-9:** Implement ring-necked pheasant specific mitigation.	None identified

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Special status species: sagebrush sparrow and sage thrasher	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Direct and indirect habitat loss would persist throughout Project operation.	Medium	Constant	Unavoidable	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified
Special status species: sagebrush sparrow and sage thrasher	BESS Substations	Direct and indirect habitat loss would persist throughout Project operation.	Negligible	Long Term	Unavoidable	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

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Special status species: tundra swan	Turbine Option 1 **Comprehensive Project**	Operation of turbines may result in the continued loss and disturbance of foraging habitat. Operation of Option 1 may result in tundra swan mortality through collision with turbines.	Low	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Veg-4:** As-built report and offset calculation. **Spec-6**: Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: tundra swan	Turbine Option 2	Operation of turbines may result in the continued loss and disturbance of foraging habitat. Turbine Option 2 is predicted to have an exposure index of 0.	Negligible	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: tundra swan	Solar Arrays	Operation of the solar array may result in continued loss of foraging habitat. Tundra swans may be killed if attempting to land on solar arrays.	Low	Long Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified

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Special status species: tundra swan	BESS Substations	Operation of the BESS and substations may result in continued loss of foraging habitat.	Negligible	Long Term	Unavoidable	Limited	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Hab-1:** Avoid corridors. **Hab-2:** Minimize transmission line crossings. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: Vaux's swift	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Vaux's swift migrating over the Lease Boundary are susceptible to strikes during migration.	Low	Long Term	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified
Special status species: Vaux's swift	Solar Arrays BESS Substations	No effects on Vaux's swift from these facilities are expected.	Negligible	Long Term	Unlikely	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified
Special status species: black-tailed jackrabbit and white-tailed jackrabbit	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Operation of the turbines may result in indirect loss of jackrabbit habitat and mortality along access roads. Direct habitat loss is expected to persist throughout operation.	Medium	Constant	Unavoidable	Confined	**Wild-4:** Avoid use of pesticides and rodenticides **Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation **Spec-10:** Implement black and white-tailed jackrabbit specific mitigation.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: black-tailed jackrabbit and white-tailed jackrabbit	Solar arrays	Solar arrays could provide shelter for jackrabbits reducing predation. Mortality may along access roads may occur.	Low	Constant	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides **Wild-6**: Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-10:** Implement black and white-tailed jackrabbit specific mitigation.	None identified
Special status species: black-tailed jackrabbit and white-tailed jackrabbit	BESS Substations	Operation of the turbines may result in direct loss of jackrabbit habitat and mortality along access roads.	Negligible	Long Term	Unavoidable	Limited	**Wild-4:** Avoid use of pesticides and rodenticides **Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-10:** Implement black and white-tailed jackrabbit specific mitigation.	None identified
Special status species: Townsend's big-eared bat	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Townsend's big-eared bat mortality may occur due to Project operation. Operation may result in indirect loss of foraging habitat.	Low	Long Term	Probable	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program **Wild-4:** Avoid use of pesticides and rodenticides **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-11:** Implement Townsend's big-eared bat specific mitigation.	None identified
Special status species: Townsend's big-eared bat	Solar Arrays	Townsend's big-eared bat may collide with solar arrays during operation.	Low	Long Term	Unlikely	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-11:** Implement Townsend's big-eared bat specific mitigation.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: Townsend's big-eared bat	BESS Substations	Interaction with BESS and substations are not predicted.	Negligible	Long Term	Unlikely	Limited	**Wild-4:** Avoid use of pesticides and rodenticides. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Spec-11:** Implement Townsend's big-eared bat specific mitigation.	None identified
Special status species: Townsend's ground squirrel	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Townsend's ground squirrel mortality may continue along access roads during operation. Operation of the solar arrays may alter Townsend's ground squirrel behavior by providing shelter. Mortality may occur along access roads.	Medium	Constant	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides **Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-12:** Implement Townsend's ground squirrel specific mitigation.	None identified
Special status species: Townsend's ground squirrel	BESS Substations	Direct habitat loss would persist through operation. Mortality may occur along access roads during operation of BESS and substations.	Negligible	Constant	Feasible	Limited	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-12:** Implement Townsend's ground squirrel specific mitigation.	None identified
Special status species: pronghorn antelope	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Operation of the Project may result in direct and indirect habitat loss to pronghorn antelope. Pronghorn antelope mortality may occur along maintenance roads.	Medium	Constant	Unavoidable	Confined	**Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-13:** Implement pronghorn antelope specific mitigation.	None identified

Table 4.6-11b: Summary of Potential Impacts on Wildlife and Habitat during Operation of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: pronghorn antelope	Solar Arrays	Pronghorn antelope would be precluded from solar arrays during operation due to fencing. Pronghorn antelope mortality may occur along maintenance roads.	Medium	Constant	Unavoidable	Confined	**Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-13:** Implement pronghorn antelope specific mitigation.	None identified
Special status species: pronghorn antelope	BESS Substations	Pronghorn antelope would be precluded from BESS and substations. Pronghorn antelope mortality may occur along maintenance roads.	Negligible	Long Term	Unavoidable	Limited	**Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-6:** Work with EFSEC on final Project layout and design. **Hab-8:** Mitigation options **Veg-4:** As-built report and offset calculation. **Spec-13:** Implement pronghorn antelope specific mitigation.	None identified

Notes:
(a) The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; TAC = Technical Advisory Committee; USFWS = U.S. Fish and Wildlife; ZOI = zone of influence
(e) Rating was modified from Medium to Low based on post-adjudication updates to the east solar array fence lines to exclude impacts to modelled wildlife movement corridors.

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Habitat loss	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The Project would result in temporary loss of habitat during decommissioning. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation.	Negligible	Short Term	Unavoidable	Local	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-7:** Roadway decommissioning. **Veg-1:** Tree Avoidance. **Veg-7:** Detailed Site Restoration Plan.	None identified
Habitat loss	Solar Arrays	The Project would result in temporary loss of habitat during decommissioning. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation.	Negligible	Short Term	Unavoidable	Confined	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-7:** Roadway decommissioning. **Veg-1:** Tree Avoidance. **Veg-7:** Detailed Site Restoration Plan.	None identified
Habitat loss	BESS Substations	The Project would result in temporary loss of habitat during decommissioning. No new permanent habitat loss is expected, and restoration activities are expected to replace and/or enhance habitat loss created during construction and operation.	Negligible	Short Term	Unavoidable	Limited	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Hab-7:** Roadway decommissioning. **Veg-1:** Tree Avoidance. **Veg-7:** Detailed Site Restoration Plan.	None identified
Mortality of non-special status species	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Sources of wildlife injuries and mortalities during decommissioning include collisions with equipment; removal of nuisance wildlife; destruction of nests, dens, and burrows; and habitat loss. The risk of mortalities would be limited to the duration of decommissioning.	Negligible	Short Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit activity disturbance by identifying sensitive areas. **Wild-6**: Maintain database of road mortalities. **Wild-7:** Schedule activities during daylight hours. **Wild-8:** Establish buffers around raptor nests.	None identified
Barriers to movement and fragmentation	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas.	Negligible	Short Term	Feasible	Confined	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan.	None identified

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Barriers to movement and fragmentation	BESS Substations	Decommissioning would remove Project-related barriers to movement and reduce habitat fragmentation by removing infrastructure and revegetating disturbed areas.	Negligible	Short Term	Feasible	Limited	**Wild-5:** Limit activity disturbance by identifying sensitive areas. **Hab-7:** Roadway decommissioning **Veg-7:** Detailed Site Restoration Plan**.**	None identified
Special status species: striped whipsnake and sagebrush lizard	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Ground disturbance and machinery use during Project decommissioning could result in mortality of striped whipsnake and sagebrush lizard.	Negligible	Short Term	Feasible	Confined	**Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-7:** Roadway decommissioning **Veg-7:** Detailed Site Restoration Plan. **Spec-1:** Implement striped whipsnake and sagebrush lizard specific mitigation.	None identified
Special status species: American white pelican	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning of the Project may disturb American white pelicans moving over the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Hab-4:** Develop TAC. **Spec-2:** Implement American white pelican specific mitigation.	None identified
Special status species: bald eagle	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning of the Project could disturb bald eagles, resulting in avoidance of the Project site.	Negligible	Short Term	Feasible	Confined	**Wild-2:** Use wildlife-resistant trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Veg-1:** Tree Avoidance. **Hab-4:** Develop TAC. **Spec-3:** Implement eagle specific mitigation.	None identified

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: burrowing owl	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning may result in mortality from machinery operation over the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule activity during daylight hours. **Wild-8**: Establish buffers around raptor nests. **Hab-4:** Develop TAC. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-4:** Implement burrowing owl specific mitigation.	None identified
Special status species: ferruginous hawk	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning may result in mortality from machinery operation over the Lease Boundary.	Negligible	Short Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Hab-4:** Develop TAC. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-5:** Ferruginous hawk specific mitigation	None identified

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: golden eagle	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning of the Project could disturb golden eagles, resulting in avoidance of the Project site, though golden eagle nesting has not been reported within 10 miles of the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Wild-2:** Use wildlife-resist trash containers. **Wild-3:** Review USFWS eagle mortality consultation. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit construction disturbance by identifying sensitive areas. **Veg-1:** Tree Avoidance. **Hab-4:** Develop TAC. **Spec-3:** Implement eagle specific mitigation.	None identified
Special status species: great blue heron and sandhill crane	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning activities may disturb birds flying over the Lease Boundary, resulting in bird flight paths being diverted around the area.	Negligible	Short Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Hab-4:** Develop TAC. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: loggerhead shrike	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning may disturb birds foraging and nesting within the Lease Boundary. Machinery could result in mortality of birds and destruction of nests.	Negligible	Short Term	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule activities during daylight hours. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Special status species: prairie falcon	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Disturbance from decommissioning activities may result in disturbance to prairie falcons.	Negligible	Short Term	Unlikely	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-8:** Establish buffers around raptor nests. **Veg-1:** Tree Avoidance. **Hab-4:** Develop TAC. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-8:** Implement prairie falcon specific mitigation.	None identified
Special status species: ring-necked pheasant	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Disturbance from decommissioning activities may result in indirect habitat loss. Access roads may result in collisions with ring-necked pheasants.	Negligible	Short Term	Feasible	Confined	**Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6**: Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-7:** Roadway decommissioning **Veg-7:** Detailed Site Restoration Plan. **Spec-9:** Implement ring-necked pheasant specific mitigation.	None identified
Special status species: sagebrush sparrow and sage thrasher	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning may disturb birds foraging and nesting within the Lease Boundary. Machinery could result in mortality of birds and destruction of nests.	Negligible	Short Term	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities. **Wild-7:** Schedule activities during daylight hours **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: tundra swan	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning may disturb tundra swans flying over and foraging within the Lease Boundary.	Negligible	Short Term	Feasible	Confined	**Wild-1:** Review 2-year raptor and bat monitoring program. **Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas. **Hab-4:** Develop TAC. **Spec-6:** Implement great blue heron, sandhill crane, and tundra swan specific mitigation.	None identified
Special status species: Vaux's swift	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning of the Project could disturb Vaux's swifts in flight over the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Hab-4:** Develop TAC. **Spec-7:** Implement loggerhead shrike, sagebrush sparrow, sage thrasher, and Vaux's swift specific mitigation.	None identified
Special status species: black-tailed jackrabbit and white-tailed jackrabbit	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Disturbance from decommissioning activities may result in indirect habitat loss. Access roads may result in collisions with jackrabbits.	Negligible	Short Term	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas **Wild-6**: Maintain database of road mortalities. **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-7:** Roadway decommissioning **Veg-7:** Detailed Site Restoration Plan. **Spec-10:** Implement black and white-tailed jackrabbit specific mitigation.	None identified
Special status species: Townsend's big-eared bat	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning activities could disturb Townsend's big-eared bat foraging within the Lease Boundary.	Negligible	Short Term	Unlikely	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-7:** Schedule construction during daylight hours **Hab-4:** Develop TAC. **Spec-11:** Implement Townsend's big-eared bat specific mitigation.	None identified

Table 4.6-11c: Summary of Potential Impacts on Wildlife and Habitat during Decommissioning of the Proposed Project

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Special status species: Townsend's ground squirrel	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Mortality may occur during decommissioning and along access roads.	Negligible	Short Term	Feasible	Confined	**Wild-4:** Avoid use of pesticides and rodenticides. **Wild-5:** Limit disturbance by identifying sensitive areas **Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-12:** Implement Townsend's ground squirrel specific mitigation.	None identified
Special status species: pronghorn antelope	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning is predicted to result in indirect habitat loss. Increased traffic on existing and new access roads may result in pronghorn antelope mortality.	Negligible	Short Term	Feasible	Confined	**Wild-5:** Limit disturbance by identifying sensitive areas. **Wild-6:** Maintain database of road mortalities **Hab-4:** Develop TAC. **Hab-5:** Manage ZOI. **Hab-7:** Roadway decommissioning. **Veg-7:** Detailed Site Restoration Plan. **Spec-13:** Implement pronghorn antelope specific mitigation.	None identified

Notes:
(a) The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; NA = not applicable; TAC = Technical Advisory Committee; ZOI = zone of influence; USFWS = U.S. Fish and Wildlife Service

4.6.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to wildlife and habitat from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.7 Energy and Natural Resources

This section evaluates the impacts of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) on the availability of energy and natural resources within the Project vicinity and in the State of Washington. Section 3.7 presents the affected environment for energy and natural resources. The Project vicinity includes the areas 4 miles south/southwest of the City of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River. The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and summarized in **Table 4.7-1**.

Table 4.7-1: Impact Rating Table for Energy and Natural Resources from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Table 4.7-2 describes the intended framework for using the magnitude rankings in the evaluation of impacts on energy and natural resources within Benton County and Washington State.

Table 4.7-2: Criteria for Assessing Magnitude of Impacts on Energy and Natural Resources

Magnitude of Impacts	Description
Negligible	Changes would either be non-detectable or, if detected, would have only slight effects. Modifications to resource availability locally or regionally would not be noticeable within existing supply chains or cause alterations to the management and distribution of natural resources.
Low	Changes to resource availability would be measurable, but the changes would be small enough to not hinder supply chains or the management and distribution of natural resources.
Medium	Changes to resource availability would be measurable and have impacts that disrupt supply chains or existing natural resource management plans. The viability of resource intensive projects would not be affected.
High	Changes to resource availability would be readily measurable and would have consequences on supply chains or the management and distribution of natural resources. The viability of resource intensive projects would be called into question.

4.7.1 Method of Analysis

This subsection compares the amount of energy and natural resources the Project would potentially require, and the quantities available. An adverse impact may occur if the Project depletes or limits access to a non-renewable resource or stresses the availability of a renewable resource.

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts related to energy and natural resources are discussed in Section 2.1.3 and summarized below.

- Any oily waste and rags would be collected in sealable drums at the construction yards, to be removed for recycling.
- Used gear oil from the turbines would be collected and recycled.
- Establish a carpool program or van service for the transportation of construction workers to the site.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.7.2.5, Post-Adjudication Applicant Commitments.

4.7.1.1 Construction Stage Requirements – Resources and Materials

Horse Heaven Wind Farm, LLC (Applicant), in the ASC, has indicated that the Project's construction stage would consume energy and natural resources. For instance, Project-related components, such as concrete and steel, require measurable quantities of raw materials. **Table 4.7-3** compares the amount of energy and natural resources needed to construct the Project and the probable availability of the commodities within the vicinity of the Lease Boundary or in the State of Washington.

Table 4.7-3: Materials and Resources Required for Project Construction

Commodity	Renewable/Non-renewable	Quantity Required	Availability of Resource
Construction Aggregate	Non-renewable	335,700 yards of gravel aggregate	The Project's construction requirement for gravel equates to approximately 1% of the 2017 State of Washington aggregate production.
Concrete	Non-renewable	500,000 cubic yards of concrete for facility foundations	The availability of concrete is related to the accessibility of cement, aggregate, and water.
Cement	Non-renewable	Information Not Available	In 2015, Washington consumed 1.8 million metric tons of cement. If the Project's concrete requires a higher percentage of cement than typical (e.g., 15%), it's possible that the Project would use approximately 7.65% of the cement used in Washington annually.
Steel	Non-renewable	97,600 tons of steel for turbine towers, solar posts and trackers, and reinforcement and support structures	In 2020, shipments from United States steel mills measured 81 million net tons. The amount of steel potentially consumed by the Project would equate to approximately 0.1% of the total steel produced in the United States annually.
Diesel and Gasoline	Non-renewable	Construction equipment has the potential to consume 80,000 gallons of diesel and gasoline	Washington has the fifth-largest crude oil refining capacity in the United States. The state's five refineries can process almost 652,000 barrels of crude oil per day. Washington refineries produce 2,592 million gallons per year of gasoline and 583 million gallons per year of diesel. Based on the refining capacity of Washington, the Project would consume approximately 0.0025% of the state's annual petroleum fuel production.
Diesel	Non-renewable	285,000 gallons of diesel for load bank generators during turbine commissioning	Washington refineries produce 583 million gallons per year of diesel. Based on the refining capacity of Washington, the Project would consume approximately 0.04% of Washington's annual diesel production.
Electricity	To be determined	To be determined	The Applicant has indicated in the ASC that electricity used during construction for the O&M Buildings would be provided by local utilities, Benton Public Utility District, and Benton Rural Electric Association, depending on construction location and service territory.

Table 4.7-3: Materials and Resources Required for Project Construction

Commodity	Renewable/Non-renewable	Quantity Required	Availability of Resource
Water	Renewable	120 million gallons of water for the mixing of concrete for structural foundations and to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction	In 2014, Kennewick supplied 3,976.9 million gallons of water to its residents and businesses. Based on Kennewick's 2014 supply data, the Project's construction water requirements would amount to approximately 3% of the annual water produced by Kennewick.

Sources: Portland Cement Association 2016, 2019; City of Kennewick 2017; AISI 2021; Horse Heaven Wind Farm, LLC 2022; DOE n.d.
ASC = Application for Site Certification; O&M = operations and maintenance

4.7.1.2 Operations Requirements – Resources and Materials

The Applicant indicated in its ASC that the Project would consume negligible amounts of energy and natural resources during operations. **Table 4.7-4** compares the amount of energy and natural resources needed to operate the Project and the probable availability of these resources within the Project vicinity or the State of Washington.

Table 4.7-4: Operational Requirements for Non-renewable and Renewable Resources

Commodity	Non-renewable/ Renewable	Quantity Required	Availability of Resource
Fuel (Gas and Diesel)	Non-renewable	Project operations have the potential to consume up to 5,000 gallons of fuel annually for vehicle use.	Based on the refining capacity of Washington, the Project's operations would consume approximately 0.00015% of Washington's annual petroleum fuel production.
Water (Total)	Renewable	Project operations have the potential to consume up to 3,850,000 gallons of water per year.	In 2014, demand for water from within Kennewick's jurisdictional boundaries was nearly 4 billion gallons. This equates to approximately 0.09% of Kennewick's annual water usage.
Water (O&M facility)	Renewable	The operations stage has the potential to consume up to 5,000 gallons per day of water for the O&M facilities. This equates to 1,825,000 gallons per year.	The annual water requirements for the O&M facilities would equate to approximately 0.04% of yearly water produced by Kennewick.

Commodity	Non-renewable/ Renewable	Quantity Required	Availability of Resource
Water (Wash Water)	Renewable	The operations stage of the Project has the potential to consume up to 2,025,000 gallons of water per year for solar panel washing.	This equates to approximately 0.05% of the water produced by Kennewick annually.
Gravel	Non-renewable	Miscellaneous or As Needed.	Multiple quarries within Benton County provide construction aggregate or gravel.

Sources: City of Kennewick 2017; Horse Heaven Wind Farm, LLC 2022; DOE n.d.
O&M = Operations and Maintenance

4.7.2 Impacts of Proposed Action

Direct impacts on energy and natural resource availability would occur as the Project consumes energy and natural resources such as fuel, water, and electricity to construct, operate and maintain, and decommission the Project.

Indirect impacts on energy and natural resources are not anticipated because the Project is not expected to substantially induce regional growth to an extent that would substantially change off-site energy and natural resource consumption.

4.7.2.1 Impacts during Construction

The Project's construction stage would result in direct adverse impacts on energy and natural resource availability. The Project's construction would require raw materials for constructing access roads, making concrete, and manufacturing Project components. As shown in **Table 4.7-3**, the Project would require the use of both renewable and non-renewable resources. The ASC states that water used to mix concrete for structural foundations and suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction would originate from the Kennewick Utility Services Division of Public Works. For instance, the Project's construction stage would use gasoline and diesel fuel for activities such as:

- Operation of construction equipment
- Transportation of Project components to the Lease Boundary
- Mobilization and demobilization of construction workers to and from the Project site
- Power portable generators and load banks

Turbine Option 1

The consumption of energy and natural resources during the Project's construction under Turbine Option 1 would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. For instance, the installation of a turbine would require steel for support structures, fuel for construction equipment and vehicles, and concrete for foundations. The manufacturing of concrete within the Project vicinity would require water sourced locally.

As shown in **Table 4.7-3**, the Project's construction would require a small fraction of the raw and manufactured materials produced regionally and nationally. For example, 97,600 tons of steel would be used in the construction of multiple components of the Project, including turbine manufacture and installation. The Project would use approximately 0.1 percent of the steel produced annually in the United States. Of the steel needed for the Project, Turbine Option 1 would require only a portion of the estimated 97,600 tons. Therefore, Turbine Option 1 construction would result in a low, short term, unavoidable, local to regional impact on energy and natural resources.

Turbine Option 2

The consumption of energy and natural resources during the Project's construction under Turbine Option 2 would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. The impact of Turbine Option 2 on energy and natural resources during the construction stage would be similar to Turbine Option 1.

Solar Arrays

The consumption of energy and natural resources during construction of the solar arrays would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. For instance, solar arrays would require metals for support structures and panel manufacturing, fuel for construction equipment and vehicles, and concrete for foundations. The manufacturing of concrete within the Project vicinity would require water sourced locally.

As shown in **Table 4.7-3**, the Project's construction would require a small fraction of the raw and manufactured materials produced regionally and nationally. An example is construction aggregate, which would be used in the construction of the solar array foundations and access roads. The Project would use approximately 1 percent of the construction aggregate consumed in Washington annually. Additionally, solar array construction would require only a portion of the Project's 335,700 yards of gravel aggregate. Therefore, solar array construction would result in a low, short term, unavoidable, local to regional impact on energy and natural resources.

Battery Energy Storage Systems

The consumption of energy and natural resources during the Project's construction of the battery energy storage systems (BESS) would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. For instance, the installation of BESS would require metal and concrete for building construction, fuel for construction equipment and vehicles, and various raw materials for BESS manufacturing. The on-site manufacturing of concrete would require water from Kennewick. Therefore, BESS construction would result in a low, short term, unavoidable, local to regional impact on energy and natural resources.

Substations

The consumption of energy and natural resources during the Project's construction of the substations would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. Based on resource availability, the impact of substation construction on energy and natural resources would be similar to Turbine Option 1. Therefore, substation construction would result in a low, short term, unavoidable, local to regional impact on energy and natural resources.

Comprehensive Project

The consumption of energy and natural resources during the Project's construction would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. The Project's construction would require metal and concrete for turbine, solar array, BESS, substation, and building construction and fuel for construction equipment and vehicles and various raw materials for manufacturing.

The Project would use approximately 0.1 percent of the steel produced annually in the United States. The on-site manufacturing of concrete would require water from Kennewick. The Project's construction water requirements would amount to approximately 3 percent of the annual water produced by Kennewick. Impact magnitude would increase from low to medium if the City of Kennewick Utility Services Division of Public Works is required to make adjustments to their water management plans. Therefore, construction activities for the comprehensive Project would result in a low to medium, short term, unavoidable, local to regional impact on energy and natural resources for Project's construction stage.

4.7.2.2 Impacts during Operation

Typical consumption of energy and natural resources during the Project's operations stage would be associated with facility operations and maintenance (O&M). As shown in **Table 4.7-4**, Project operations would require both renewable and non-renewable resources. The 2022 ASC states that water consumption during the Project's operations stage would be associated with the limited needs of the O&M facilities and solar panel washing. Consumption of non-renewable resources during operations would be associated with the following activities:

- Electricity for lighting, heating, and other domestic purposes at the O&M facilities, which would be served by the local electric utility
- Gasoline and diesel fuel in vehicles used to patrol the site and maintain the facility
- Petroleum-based lubricants for maintenance and repair activities
- Aggregate for access road maintenance

Turbine Option 1

The consumption of energy and natural resources during the Project's operations stage under Turbine Option 1 would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. **Table 4.7-4** shows an analysis of necessary energy and natural resource requirements for the Project's operations. Turbine maintenance may require replacement turbines and generator-specific lubricants and fluids produced outside the Project vicinity. O&M vehicles would need an ongoing supply of fuel purchased locally. Water for the Project's O&M facility would be purchased from a local vendor and sourced from Kennewick.

Specifically, Project operations have the potential to consume up to 5,000 gallons of fuel annually for vehicle use. The Project's operations would consume approximately 0.00015 percent of Washington's annual petroleum fuel production. As gravel becomes displaced by traffic, winter plowing operations, and erosion of material in heavy rain, Turbine Option 1 access roads would require routine blading and adding gravel as needed either by "spot graveling" or re-graveling entire sections (USDOT 2015). As shown in Section 3.7, multiple sources of aggregate exist within Benton County. Due to the widespread availability of lubricants, fuel, vendor supplied water, and aggregate, operations of Turbine Option 1 would constitute a low, long term, unavoidable, local to regional impact.

Turbine Option 2

The consumption of energy and natural resources during the Project's operations stage under Turbine Option 2 would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. The impact of Turbine Option 2 on energy and natural resources during the Project's operations stage would be similar to Turbine Option 1. Due to the widespread availability of lubricants, fuel, vendor supplied water, and aggregate, operations of Turbine Option 2 would constitute a low, long term, unavoidable, local to regional impact.

Solar Arrays

The consumption of energy and natural resources during the solar arrays' operations stage would be measurable and would impact resource availability within the vicinity of the Lease Boundary and the State of Washington. For instance, using water to wash solar panels would impact the amount of available water that Kennewick would have to address future demands and replacement panels would require raw materials for manufacturing. O&M vehicles would need fuel purchased locally.

Specifically, the operations stage of the solar arrays has the potential to consume up to 2,025,000 gallons of water per year for solar panel washing. As shown in **Table 4.7-4**, this equates to approximately 0.05 percent of the water produced by Kennewick annually. As gravel becomes displaced by traffic, winter plowing operations, and erosion of material in heavy rain, solar array access roads would require routine blading and adding gravel as needed either by "spot graveling" or re-graveling entire sections (USDOT 2015). As shown in Section 3.7, multiple sources of aggregate exist within Benton County. Based on energy and natural resource availability, operation of the solar arrays would constitute a low, long term, unavoidable, local to regional impact.

Battery Energy Storage Systems

The consumption of energy and natural resources during the BESS operations stage would be measurable and would impact resource availability within the vicinity of the Lease Boundary and the State of Washington. The impact of BESS on energy and natural resources during the Project's operations stage would be similar to Turbine Option 1. For instance, the maintenance and replacement BESS would require fuel for maintenance equipment and vehicles, and various raw materials for replacement BESS manufacturing. Water for the Project's O&M facility would be purchased from a local vendor and sourced from Kennewick. As shown in **Table 4.7-4**, the operations stage has the potential to consume up to 5,000 gallons per day of water for the O&M facilities. This equates to 1,825,000 gallons per year or 0.04 percent of the yearly water produced by Kennewick. As gravel becomes displaced by traffic, winter plowing operations, and erosion of material in heavy rain, solar array access roads would require routine blading and adding gravel as needed either by "spot graveling" or re-graveling entire sections (USDOT 2015). As shown in Section 3.7, multiple sources of aggregate exist within Benton County. Based on energy and natural resource availability, operation of the BESS would constitute a low, long term, unavoidable, local to regional impact.

Substations

The consumption of energy and natural resources associated with the operation of the substations would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington. The impact of substation operations on energy and natural resources would be similar to Turbine Option 1. Due to the widespread availability of lubricants, fuel, vendor supplied water, and aggregate, operations of substations would constitute a low, long term, unavoidable, local to regional impact.

Comprehensive Project

The consumption of energy and natural resources during the Project's operations would be measurable and would impact resource availability within the vicinity of the Lease Boundary and in the State of Washington.

Project operation and maintenance may require generator-specific lubricants and fluids produced outside the Project vicinity. O&M vehicles would need an ongoing supply of fuel purchased locally. Project operations have the potential to consume up to 5,000 gallons of fuel annually for vehicle use. The Project's operations would consume approximately 0.00015 percent of Washington's annual petroleum fuel production.

Water for the Project's O&M facility and solar panel washing would be purchased from a local vendor and sourced from Kennewick. The Project's O&M facility has the potential to consume up to 5,000 gallons of water per day. This equates to 1,825,000 gallons per year, or 0.04 percent of the yearly water produced by Kennewick. The operations stage of the solar arrays has the potential to consume up to 2,025,000 gallons of water per year for solar panel washing. As shown in **Table 4.7-2**, this equates to approximately 0.05 percent of the water produced by Kennewick annually.

As gravel becomes displaced by traffic, winter plowing operations, and erosion of material in heavy rain, the Project's access roads would require routine blading and adding gravel as needed either by "spot graveling" or re-graveling entire sections (USDOT 2015). As shown in Section 3.7, multiple sources of aggregate exist within Benton County. Based on resource availability, operation and maintenance for the comprehensive Project would result in a low to medium, long term, unavoidable, local to regional impact on energy and natural resources.

4.7.2.3 Impacts during Decommissioning

As a result of the Lease Boundary being returned to its preconstruction state, the need for measurable quantities of water, concrete, and other renewable and non-renewable resources for decommissioning is expected to be low. Decommissioning activities would not likely require metals associated with energy component manufacturing. Impacts from energy consumption during Project decommissioning would be similar to or less than those described for the Project's construction stage. Energy consumption, predominantly in the form of gasoline, diesel fuel, and electricity, would be required to operate equipment such as cranes, trucks, tools, and vehicles used to dismantle and remove most Project facilities and reclaim disturbed areas.

As part of the decommissioning process, the Applicant would repurpose or reuse the Project's high-value components. Recyclable materials would be reduced to a transportable size and removed from the site to an appropriately designated recycling center. Unsalvageable material would be reduced to a transportable size and removed from the site and permanently disposed of in accordance local, state, and federal solid waste regulations.

Turbine Option 1

The consumption of energy and natural resources during the Project's decommissioning of Turbine Option 1 would be measurable and affect resource availability within the vicinity of the Lease Boundary. The Project's decommissioning stage would likely require smaller quantities of energy and natural resources than the construction stage. The dismantling of structures and backfilling of void spaces would require energy and construction aggregate. There are local sources of fuel and construction aggregate to support the decommissioning stage. Decommissioning of Turbine Option 1 would constitute a low, short term, unavoidable, local impact on energy and natural resources.

Turbine Option 2

The consumption of energy and natural resources during the Project's decommissioning of Turbine Option 2 would be measurable and affect resource availability within the vicinity of the Lease Boundary. Impacts from the decommissioning of Turbine Option 2 on energy and natural resources would be similar to those described for Turbine Option 1. Decommissioning of Turbine Option 2 would constitute a low, short term, unavoidable, local impact on energy and natural resources.

Solar Arrays

The consumption of energy and natural resources during the Project's decommissioning of the solar arrays would be measurable and affect resource availability within the vicinity of the Lease Boundary. Impacts from the decommissioning of the solar arrays on energy and natural resources would be similar to those described for Turbine Option 1. Decommissioning of solar arrays would constitute a low, short term, unavoidable, local impact on energy and natural resources.

Battery Energy Storage Systems

The consumption of energy and natural resources during the Project's decommissioning of the BESS would be measurable and affect resource availability within the vicinity of the Lease Boundary. Impacts from the decommissioning of the BESS on energy and natural resources would be similar to those described for Turbine Option 1. Decommissioning of BESS would constitute a low, short erm, unavoidable, local impact on energy and natural resources.

Substations

The consumption of energy and natural resources during the Project's decommissioning of the substations would be measurable and affect resource availability within the vicinity of the Lease Boundary. Impacts from the decommissioning of the substations on energy and natural resources would be similar to those described for Turbine Option 1. Decommissioning of substations would constitute a low, short term, unavoidable, local impact on energy and natural resources.

Comprehensive Project

The consumption of energy and natural resources during the Project's decommissioning would be measurable and affect resource availability within the vicinity of the Lease Boundary. Impacts from decommissioning of the Project on energy and natural resources would be similar to those described for Turbine Option 1. Decommissioning of the comprehensive Project would constitute a low, short term, unavoidable, local impact on energy and natural resources.

4.7.2.4 Recommended Mitigation Measures

This section describes the measures that would reduce or compensate for impacts related to energy and natural resources from construction, operation, and decommissioning of the Project. The Washington Energy Facility Site Evaluation Council (EFSEC) has identified the following additional and modified mitigation measures for the Project to avoid and/or minimize potential impacts on energy and natural resources. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action:

ENR-1:[40] The Applicant would provide an executed agreement to EFSEC that identifies the source and quantity of water intended to be supplied to the Project prior to its construction, operation, and decommissioning.

Rationale: Provides verification that water being used by the Project is originating from a sustainable source.

ENR-2: The Applicant would install high-efficiency electrical fixtures and appliances in the O&M facility, BESS, and substations to reduce energy needs for the Project's operations stage.

Rationale: Reduces the Project's demands on energy and natural resources.

ENR-3: The Applicant would install high-efficiency security lighting to reduce energy needs for the Project's operations stage.

Rationale: Reduces the Project's demands on energy resources.

ENR-4: The Applicant would install low-water-use flush toilets in the O&M facilities to reduce the Project's water requirements during its operations stage.

Rationale: Reduces the Project's demands on water resources.

ENR-5: The Applicant would capture and recycle wash water to reduce the Project's water requirements during its operations stage.

Rationale: Reduces the Project's demands on water resources.

ENR-6: To retrieve as much of the natural resources used in construction and operation of the Project as possible, the Applicant would demolish and recycle all components of the Project that have the potential to be used as raw materials in commercial or industrial applications. If the Applicant intends to leave any portion of the facility, including concrete foundations, they must submit a request to EFSEC in an update to their decommissioning plan.

Rationale: Reduces the Project's demands on natural resources.

4.7.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns.

[40] ENR-: Identifier of numbered mitigation item for Energy and Natural Resources

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and consider undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[41]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remain. The additional Applicant commitments identified above do not change the impact ratings previously provided for energy and natural resources in the Draft EIS, and the impact ratings remain the same.

[41] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

4.7.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (Washington Administrative Code 197-11-794).

This Environmental Impact Statement weighs the potential impacts on energy and natural resources that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.7-5a, 4.7-5b, and 4.7-5c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to energy and natural resources.

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Table 4.7-5a: Summary of Potential Impacts on Energy and Natural Resources during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Consumption of Raw Materials and Commodities	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations	The installation of a turbine would require steel for support structures, fuel for construction equipment and vehicles, and concrete for foundations. The manufacturing of concrete within the Project vicinity would require water sourced locally.	Low	Short Term (for the entire component)	Unavoidable	Local to Regional (depending on sourcing of the materials)	**ENR-1:** Executed water supply agreement	None identified
Consumption of Raw Materials and Commodities	**Comprehensive Project**	The Project's construction would require metal and concrete for turbine, solar array, BESS, substation, and building construction and fuel for construction equipment and vehicles and various raw materials for manufacturing. The Project's construction water requirements would amount to approximately 3% of the annual water produced by Kennewick. Impact magnitude would increase from low to medium if the City of Kennewick Utility Services Division of Public Works is required to make adjustments to their water management plans.	Low to Medium (i.e., will increase if the City of Kennewick Utility Services Division of Public Works is required to make adjustments to their water management plans)	Short Term	Unavoidable	Local to Regional (depending on sourcing of the materials)	**ENR-1:** Executed water supply agreement	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.7-5b: Summary of Potential Impacts on Energy and Natural Resources during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Consumption of Raw Materials and Commodities	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations	Turbine maintenance may require generator-specific lubricants and fluids produced outside the Project vicinity. O&M vehicles would need an ongoing supply of fuel purchased locally. Water for the Project's O&M facility would be purchased from a local vendor and sourced from Kennewick. Aggregate for access road maintenance would be obtained locally.	Low	Long Term	Unavoidable	Local to Regional (depending on sourcing of the materials)	**ENR-1:** Executed water supply agreement **ENR-2:** Install high-efficiency electrical fixtures and appliances **ENR-3:** Install high-efficiency security lighting **ENR-4:** Install low-water-use flush toilets **ENR-5:** Capture and recycle wash water	None identified
Consumption of Raw Materials and Commodities	**Comprehensive Project**	Project maintenance may require generator-specific lubricants and fluids produced outside the Project vicinity. O&M vehicles would need an ongoing supply of fuel purchased locally. Water for the Project's O&M facility and solar panel washing would be purchased from a local vendor and sourced from Kennewick. Aggregate for access road maintenance would be obtained locally.	Low to Medium	Long Term	Unavoidable	Local to Regional (depending on sourcing of the materials)	**ENR-1:** Executed water supply agreement **ENR-2:** Install high-efficiency electrical fixtures and appliances **ENR-3:** Install high-efficiency security lighting **ENR-4:** Install low-water-use flush toilets **ENR-5:** Capture and recycle wash water	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; O&M = operations and maintenance

Table 4.7-5c: Summary of Potential Impacts on Energy and Natural Resources during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Consumption of Raw Materials and Commodities	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Energy consumption, predominantly in the form of gasoline, diesel fuel, and electricity, would be required to operate equipment such as cranes, trucks, tools, and vehicles used to dismantle and remove most Project facilities and reclaim disturbed areas. Backfilling void spaces created by the removal of foundations would require construction aggregate.	Low	Short Term	Unavoidable	Local	**ENR-6:** Recycle all components of the Project	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

4.7.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to energy and natural resources from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.8 Land and Shoreline Use

Washington Administrative Code (WAC) 197-11-444 requires that a State Environmental Policy Act evaluation include an analysis of land and shoreline use. Section 3.8 presents the affected environment for land and shoreline use. This section evaluates the impacts of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) on Benton County designated Growth Management Act (GMA) Agriculture lands within the Lease Boundary and the wineries and agritourism businesses located near the Project. In addition to agriculture, WAC 197-11-444 also requires an analysis of the following resource topics as part of an evaluation of land and shoreline use:

- Section 4.16 Socioeconomics - Housing
- Section 4.10 Visual Aspects, Light and Glare – Light and Glare
- Section 4.10 Visual Aspects, Light and Glare – Aesthetics
- Section 4.12 Recreation
- Section 4.9 Historic and Cultural Resources – Historic and Cultural Preservation

These additional resource topics are evaluated in their corresponding sections. Appendix 3.8-1 presents a consistency analysis of the Project, the Benton County Comprehensive Plan, and Benton County zoning ordinances. The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and summarized in **Table 4.8-1**.

Table 4.8-1: Impact Rating Table for Land and Shoreline Use from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Table 4.8-2 describes the intended framework for using the magnitude rankings in the evaluation of impacts on lands designated as GMA Agriculture within the Lease Boundary and wineries and agritourism businesses located near the Project.

Table 4.8-2: Criteria for Assessing Magnitude of Impacts on Growth Management Act Agricultural Designated Lands

Magnitude of Impacts	Impacts on Agriculture, Wineries, and Agritourism
Negligible	**Loss of Productivity:** No change in the management of GMA Agricultural lands. Loss of agricultural production or GMA Agricultural lands would not be detectable. **Reduction in Profitability:** Indirect impacts from the Project on environmental setting and viewing opportunities for nearby wineries and agritourism businesses would not occur. The Project would have no impact on the ability of the wineries and agritourism businesses to remain profitable and continue operations.
Low	**Loss of Productivity:** Changes to agricultural production or loss of GMA Agricultural lands would be measurable, but the changes would not impact the ability of a farm to remain profitable and continue operations. Any changes to GMA Agricultural lands would be reversible following the decommissioning stage. **Reduction in Profitability:** Indirect impacts on environmental setting and viewing opportunities would not impact the ability of wineries and agritourism businesses to remain profitable and continue operations. Potential changes would be reversible following the decommissioning stage.
Medium	**Loss of Productivity:** Changes to agricultural production or loss of GMA Agricultural lands would be measurable and would impact profitability and operations but would be reversible following the decommissioning stage. **Reduction in Profitability:** Indirect impacts on environmental setting and viewing opportunities may change the profitability and operations of wineries and agritourism businesses. Potential changes would be reversible following the decommissioning stage.
High	**Loss of Productivity:** Changes to agricultural production or loss of GMA Agricultural lands would be measurable and would affect a farm's ability to remain a profitable operation and could be irreversible. **Reduction in Profitability:** Indirect impacts on environmental setting and viewing opportunities would impact profitability and operations of wineries and agritourism businesses. Potential changes could be irreversible.

GMA = Growth Management Act

4.8.1 Method of Analysis

As noted in Section 3.8, Benton County's comprehensive land use plan and land use regulations were prepared in accordance with the GMA. The Local Project Review Act (Chapter 36.70B Revised Code of Washington) encourages counties and cities that are subject to the GMA to rely on applicable development regulations and comprehensive land use plan policies in analyzing and addressing environmental impacts.

For aspects of the Project's design that may not be in alignment with Benton County Code 11.17.070 Growth Management Act Agricultural District or the Benton County Comprehensive Plan, the Washington Energy Facility Site Evaluation Council (EFSEC) conducts an adjudicative process to evaluate arguments and evidence from the applicant and intervening parties, including the county government, and to make findings of fact and legal determinations pertinent to whether the project should be approved outright, approved with conditions, or denied.

The Benton County Comprehensive Plan states that the county should accommodate the land needs of both agricultural and non-agricultural uses. With regards to rezoning agricultural lands, Benton County's Comprehensive Plan states the following:

> *In general, it was deemed important to maintain continuity in agricultural resource land designation; unless there are sufficient reasons that the agricultural resource land should be de-designated, land should remain as agricultural resource land to protect the resource. (Benton County 2022)*

The Benton County Comprehensive Plan states that the county should maintain the financial viability of all economic sectors. Benton County considers the following guiding principles in managing designated GMA Agriculture lands within its jurisdictional boundaries:

- Preserve and protect agricultural and resource lands
- Allow rural lifestyle in rural lands
- Allow growth where services are available (Benton County 2022)

Economic Considerations

Decreases in food security and farmer profitability are adverse impacts that could occur from converting agricultural lands to non-agricultural purposes. Conversely, decreases in supply of agricultural products could increase the value of the product. **Table 4.8-3** summarizes wheat yields and crop value in Washington State for the years 2020 and 2021.

Table 4.8-3: Summary of Wheat Yields and Value in Washington State

Harvest Year	Price Per Bushel of Wheat	Average Yield Per Acre	State-Wide Production of Wheat (bushels)
2020	$ 5.70	72.4	166,245,000
2021	$ 8.67	39.1	87,180,000

Source: USDA 2022a

The Project would be microsited to avoid and minimize disruptions to existing cropland. Additionally, the Project would provide new revenue to participating agricultural landowners via lease agreements (Horse Heaven Wind Farm, LLC 2022). Horse Heaven Wind Farm, LLC (Applicant) has not made the value of its agreements with participating landowners public.

In addition to direct impacts on crop production, adverse indirect impacts on wineries and agritourism businesses could occur. For instance, potential changes to the environmental setting's visual aspects could affect the aesthetics associated with the wineries and their agritourism businesses (e.g., tasting rooms).

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on land and shoreline use are discussed in Section 2.1.3 and summarized below.

- Project construction and operation would follow site-specific best management practices to minimize potential impacts on noise, traffic, vegetation, visual resources, and air quality, as described in the respective resource sections of the ASC.
- Upon decommissioning of the Project, the Applicant would remove all above-grade infrastructure and below-ground infrastructure to a depth of not less than 3 feet below grade.
- The Applicant would replace topsoil and reseed areas where facilities were located with grasses and/or other vegetation reasonably acceptable to the landowner.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.8.2.5, Post-Adjudication Applicant Commitments.

4.8.2 Impacts of Proposed Action

Impacts associated with or attributable to specific Project elements are discussed for each Project stage below. Potential direct impacts of the Project would include the conversion of agricultural lands to utility-related uses and a reduction in agricultural productivity of designated GMA Agriculture lands. Similar to what is presented in Section 4.5, Vegetation, loss of agricultural lands is divided into two types:

- **Temporary Disturbance**: Loss of agricultural productivity would end when construction is complete, and the area would be restored to preconstruction condition (WDFW 2009). Temporary disturbance from Project construction would occur in equipment laydown areas, construction staging areas, some roads, and areas required for construction that would not be part of the permanent infrastructure. These areas would be returned to the applicable agricultural purpose once construction is complete.
- **Permanent Disturbance**: Loss of agricultural productivity would persist throughout the life of the Project and would not be fully restored until following Project decommissioning (WDFW 2009). Permanent disturbance from Project construction (which extends into operation and decommissioning) would occur in the areas of the final tower footings and associated access roads, the substations, fencing around the solar arrays, and all areas occupied by permanent structures. Permanent disturbance also includes areas identified by the Applicant as modified habitat, which includes areas within the fencing around solar arrays. The areas under and between solar arrays would be disturbed during Project construction and would be replanted following construction; however, areas under the solar arrays would not support agricultural activities.

As shown in **Table 4.8-4**, the Project during construction would permanently impact 6,869 acres and temporarily impact 2,957 acres of the Lease Boundary's 72,428 acres (Horse Heaven Wind Farm, LLC 2022). As such, construction activities would impact approximately 14 percent of the Lease Boundary. Construction activities would cause both temporary and permanent impacts. Of the acreage permanently impacted by the Project, approximately 6,866 acres are agricultural lands. Of the agricultural lands permanently impacted by the Project, approximately 99 percent are being managed for dryland wheat. Within the Wind Energy Micrositing Corridor and Solar Siting Area alone, 21,216 acres are managed as dryland wheat. Of the 2,957 acres temporarily impacted by construction, 2,324 acres are currently being managed for agricultural purposes (Horse Heaven Wind Farm, LLC 2022).

Table 4.8-4: Impacts on Agricultural Lands within the Lease Boundary

Impact Status	Project Impacts on Lease Boundary (acres)[b]	Percentage of Lease Boundary Impacted by Project	Project Impacts on Agricultural Land (acres)	Percentage of Project Impacts That Are Agricultural Land
Permanent[c]	6,869	9.5%	6,866	99.9%
Temporary	2,957	4%	2,324 [b]	79%

Source: Horse Heaven Wind Farm, LLC 2022
Notes:
(a) Based on Turbine Option 1 maximum number of turbines
(b) Land could be returned to agricultural production following decommissioning

Land north of and adjacent to the Lease Boundary consists predominantly of dryland agriculture and agricultural rangelands, with small areas of adjacent development. Land to the east and south of, and adjacent to, the Lease Boundary consists predominantly of a mixture of dryland and irrigated agriculture. Land west of and adjacent to the Lease Boundary consists of dryland agriculture (Horse Heaven Wind Farm, LLC 2022).

Table 4.8-5 shows an analysis of the agricultural management practices for GMA Agriculture designated lands within Benton County, and the impacts that the Project would have on these land use types.

Table 4.8-5: Analysis of Project Impacts on Benton County GMA Agricultural Designated Lands

GMA Agriculture Land Type	County-wide Total Acres	Permanent Impact Acres[a]	Percentage of County GMA Total Acreage Permanently Impacted
Dryland	304,839	6,863	2.3
Irrigated	296,432	2	<0.01
Rangeland	112,190	1	<0.01

Sources: Benton County 2020; Horse Heaven Wind Farm, LLC 2022
(a) Land could potentially be returned to agricultural production following decommissioning
GMA = Growth Management Act

Indirect Impacts on Wineries and Agritourism

Indirect impacts on wineries and agritourism businesses outside the Lease Boundary would occur from changes to viewsheds. The following provides a brief summary of visual impacts discussed in Section 4.10 that would affect wineries and agritourism businesses near the Project:

- The Project would result in the Horse Heaven Hills and northern ridgeline becoming dominated by energy infrastructure.
- The potential exists for long-duration views of energy infrastructure from areas within the communities between Benton City and Kennewick.

These impacts on aesthetics would be greater in areas with unobstructed views of a large number of turbines. Even where the existing setting includes a smaller wind farm and two existing transmission lines, the scale of the Project and prominence of the proposed turbines would result in visual impacts on the existing landscape. The following sections include discussion of the Project's indirect impact on wineries and agritourism businesses for each of the Project's stages and components.

4.8.2.1 Impacts during Construction

Direct Impacts

The Applicant defines permanent disturbance as the facility's foundation and graveled area and temporary disturbance as the area around the facility. Wind turbines, solar arrays, battery energy storage systems (BESS), substations, and transmission lines would all require subsurface foundations, while the Applicant has indicated that the Project's permanent access roads would be gravel. Temporary land use disturbance would result from the following actions:

- Preparation of laydown yards
- Construction of access roads, road modifications, and crane paths
- Installation of turbines
- Installation of overhead and underground collectors
- Installation of transmission lines, meteorological towers, and meteorological tower roads
- Construction of substations, BESS, and solar arrays
- Construction of the operations and maintenance (O&M) facility

The estimated amount of temporary land disturbance would be similar under Turbine Option 1 and Turbine Option 2 (see Chapter 2, Proposed Action and Alternatives) for all Project construction phases. Section 4.14, Transportation, evaluates the impact that additional truck traffic may have on neighboring rural communities.

It is anticipated that once construction of the solar arrays has begun, exclusionary fencing would prevent further livestock access to the solar fields. Additionally, agricultural land that would be permanently disturbed by Project facilities would limit agricultural uses within the Lease Boundary. Permanent facilities would include turbine support structures, solar array and substation areas, and O&M facilities (Horse Heaven Wind Farm, LLC 2022).

Indirect Impacts

Indirect impacts on wineries and agritourism businesses would occur as the Project's contractor removes existing vegetation and installs turbines, causing a contrast with the surrounding landscape. Potential changes to the viewshed from construction activities would diminish the aesthetic value presented to the wineries and agritourism visitors. Specifically, the parts of the businesses that would be mostly impacted by the diminished aesthetic value are the areas that cater to the customers leisure experiences (e.g., tasting rooms, outdoor dining and patios, and tours of the farms or vineyards).

Turbine Option 1

Agricultural Productivity

Agricultural productivity would be directly impacted by Turbine Option 1. Construction activities under Turbine Option 1 would result in a negligible to low, temporary to short-term, unavoidable, limited to regional impact on agricultural activities during the Project's construction stage. As shown in **Tables 4.8-4** and **4.8-5**, the majority of the Project's land-disturbing activities would occur on agricultural lands used for dryland wheat production.

Table 2.1-1 of Chapter 2, Proposed Action and Alternatives, illustrates that the combined permanent land disturbance from Turbine Option 1 would be 30 acres and the temporary disturbance would be 1,070 acres.

During Project construction, it may be necessary to remove cattle from areas where blasting or heavy equipment operations take place. Project construction could delay agricultural activities for short durations on adjacent properties. For instance, Project-related truck traffic and construction activities could cause temporary delays in the movement of farm machinery within and around the Lease Boundary. During construction, reduced access to fields within the Lease Boundary could impact existing dryland agricultural management programs.

Based on 2020 and 2021 U.S. Department of Agriculture (USDA) wheat statistics for the State of Washington, Turbine Option 1 could reduce wheat yields in Benton County by 35,420 to 82,500 bushels for any given year. This analysis assumes that all 1,100 temporary and permanently impacted acres under Turbine Option 1 could be lost to production for the entire construction stage. Loss of a single harvest season for approximately 1,100 acres would equate to approximately 0.05 percent of Washington's annual wheat production (USDA 2022a).

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by Turbine Option 1. As stated in Section 3.8, the two closest wineries are located approximately 1 mile and 1.8 miles north of the Lease Boundary. These two wineries are located outside the foreground distance zone, which is defined as 0 to 0.5 miles from the Project. The foreground distance zone would have views of a large portion of the Project during the construction stage under Turbine Option 1. The majority of the other wineries located to the north of the Lease Boundary are approximately 2.5 to 5 miles away.

The two closest wineries would experience more visual contrasts related to construction under Turbine Option 1 than the wineries located further away. For the wineries located between 2.5 and 5 miles from the Lease Boundary, construction activities would be mostly indiscernible. As analyzed in Section 4.10, viewpoints and key observation points (KOPs) located within the foreground distance zone would experience the greatest impacts from construction under Turbine Option 1. The construction of access roads, crane paths, collector and communication lines, and wind turbines would be noticeable when viewed from 0 to 0.5 miles from the Lease Boundary. There are no wineries or agritourism businesses within the foreground distance zone. Based on the location of the nearest wineries and agritourism businesses in relation to the Project, indirect impacts on wineries and wine-tasting tourism would be low, short term, feasible, and local.

Turbine Option 2

Agricultural Productivity

Agricultural productivity would be directly impacted by Turbine Option 2. Construction activities under Turbine Option 2 would result in a negligible to low, temporary to short-term, unavoidable, limited to regional impact on agricultural activities during the Project's construction period. As shown in **Table 4.8-4** and **Table 4.8-5**, the majority of the Project's land-disturbing activities would occur on agricultural lands. Table 2.1-1 of Chapter 2, Proposed Action and Alternatives, illustrates that the combined permanent land disturbance from turbine installation under Turbine Option 2 would be 30 acres and the temporary disturbance would be 1,070 acres. Impacts on agricultural activities from construction under Turbine Option 2 would be similar to those presented for Turbine Option 1.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by Turbine Option 2. The Applicant estimates that the lower number of turbines under Option 2 would result in a lower level of contrast and fewer modifications of the existing landscape character than Turbine Option 1. However, construction under Turbine Option 2 would still result in indirect impacts on the viewsheds of wineries and agritourism businesses near the Project. Construction would include ground excavations, use of heavy equipment, and installation of turbines. It is estimated that the Project's indirect impacts on the viewsheds of wineries and agritourism businesses would be similar to those presented for construction under Turbine Option 1.

Solar Arrays

Agricultural Productivity

Agricultural productivity would be directly impacted by solar array construction. Construction activities for the Project's solar arrays would result in a low, temporary to short-term, unavoidable, limited to regional impact on agricultural activities during the Project's construction period. As shown in **Table 4.8-4** and **Table 4.8-5**, the majority of the Project's land-disturbing activities would occur on agricultural lands. Table 2.1-2 of Chapter 2, Proposed Action and Alternatives, illustrates that the combined permanent land disturbance from the three solar arrays would be 6,570 acres and the temporary disturbance would be 77 acres.

Using 2020 and 2021 USDA wheat statistics for the State of Washington, the solar arrays could reduce wheat yields in Benton County by 259,898 to 481,243 bushels for any given year. This analysis assumes that all 6,647 temporary and permanently impacted acres under the solar arrays action would be lost to production for the entire construction stage. A loss of a single harvest season for approximately 6,647 acres would equate to approximately 0.3 percent of Washington's annual wheat production. While the United States ranks among the top three global wheat exporters, any decrease in global wheat supplies could impact the ability of vendors and suppliers in the Pacific Northwest to make up for a reduction in wheat grown locally (USDA 2022b).

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by solar array construction. The construction of the solar arrays would occur within a smaller, more defined area associated with the selected solar array areas of the Lease Boundary. The conversion of existing agricultural lands to land containing photovoltaic panels would result in visual contrast and changes in the landscape setting. Construction of the solar arrays would mainly impact viewing opportunities located within the foreground distance zone. Because no wineries or agritourism businesses are located within the foreground distance zone, construction of the solar arrays would result in negligible, short-term, unlikely, and local indirect impacts.

Battery Energy Storage Systems

Agricultural Productivity

Agricultural productivity would be directly impacted by BESS construction. Construction activities for the BESS would result in a negligible to low, temporary to short-term, unavoidable, limited to regional impact on agricultural activities during the Project's construction stage. As shown in **Table 4.8-4** and **Table 4.8-5**, the majority of the Project's land-disturbing activities would occur on agricultural lands. Table 2.1-2 of Chapter 2, Proposed Action and Alternatives, illustrates that the combined permanent land disturbance from the BESS would be 18 acres and the temporary disturbance would be 1 acre. Impacts on agricultural activities from the construction of BESS would be similar to those presented for Turbine Option 1.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by BESS construction. Indirect impacts related to construction of the BESS would be similar to those anticipated for the construction of the solar arrays.

Substations

Agricultural Productivity

Agricultural productivity would be directly impacted by substation construction. Construction activities for substations would result in a negligible to low, temporary to short-term, unavoidable, limited to regional impact on agricultural activities during the Project's construction period. As shown in **Table 4.8-4** and **Table 4.8-5**, the majority of the Project's land-disturbing activities would occur on agricultural lands. Table 2.1-2 of Chapter 2, Proposed Action and Alternatives, illustrates that the combined permanent land disturbance from the substations would be 38 acres and the temporary disturbance would be 3 acres. Impacts on agricultural activities from the construction of substations would be similar to those presented for Turbine Option 1.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by substation construction. Indirect impacts related to construction of the substations would be similar to those anticipated for the solar arrays and BESS.

Comprehensive Project

Agricultural Productivity

Agricultural productivity would be directly impacted by construction of the comprehensive Project. Construction activities for the comprehensive Project would result in a low to medium, temporary to short-term, unavoidable, limited to regional impact on agricultural activities during the Project's construction period. As shown in **Table 4.8-4** and **Table 4.8-5**, the majority of the Project's land-disturbing activities would occur on agricultural lands. Except for magnitude, impacts on agricultural activities from the construction of the comprehensive Project would be similar to those presented for Turbine Option 1 and the solar arrays. As a result of constructing various components of the Project simultaneously, the magnitude of impact on agricultural management plans is likely to increase when compared to the Project's individual components. It is anticipated that the farmers and ranchers would have to continuously adapt to construction activities as the Project's construction progresses.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by construction of the comprehensive Project. During the comprehensive Project's 23-month construction schedule, there would be short-term indirect impacts from construction activities occupying a large portion of the landscape. The removal of vegetation would be noticeable in the setting and contrast with the existing character. The indirect impact from the removal of vegetation on the wineries' and agritourism businesses' viewshed would be temporary as revegetated areas post-construction would begin to resemble surrounding landscapes.

As analyzed in Section 4.10, KOPs located within the foreground distance zone would experience the greatest impacts from construction of the comprehensive Project. Assessment of visual resources concluded that construction of the comprehensive Project would result in short-term impacts beyond the neighboring receptors. For more details on potential impacts on visual aspects refer to Section 4.10.

As stated in Section 3.8, the two closest wineries to the Project site are located approximately 1 mile and 1.8 miles north of the Lease Boundary. These two wineries are located outside the foreground distance zone, which would have views of a large portion of the Project's construction phase. The majority of other wineries located to the north of the Lease Boundary are approximately 2.5 to 5 miles away.

The two closest wineries would experience more visual contrasts than the wineries located further away. For the wineries located between 2.5 and 5 miles from the Project site, construction activities would be mostly indiscernible. Based on the location of the wineries in relationship to the Project, the comprehensive Project would result in low, short-term, feasible, and local indirect impacts on nearby agritourism and wineries. The magnitude rating would be potentially reduced for wineries and agritourism businesses whose customer focused experiences are directed away or located within areas that have existing barriers to viewing the Project.

4.8.2.2 Impacts during Operation

Direct Impacts

Project facilities would result in the permanent conversion of 6,869 acres of the Lease Boundary's 72,428 acres. The 6,866 acres currently managed for agricultural purposes converted for the Project would no longer be available for agricultural use. Permanently altered acreage would represent 9 percent of the 72,428 acres of land designated as GMA Agriculture within the Lease Boundary and 1 percent of the 649,153 acres of land designated as GMA Agriculture within Benton County.

During operation, agricultural uses would continue within the Lease Boundary and surrounding area (Horse Heaven Wind Farm, LLC 2022). Except for places where livestock would be specifically excluded or where dryland wheat would be grown, cattle, sheep, and other domestic animals would be able to graze up to the turbines and around transmission and collector line support structures. The 2022 ASC states that exclusionary fencing would be installed around the solar arrays. In this context, loss of dryland wheat and grazing land would constitute an adverse impact on agricultural activities during operation.

Indirect Impacts

Indirect impacts on agritourism and wineries near the Project would occur as the presence of turbines occupying the landscape diminishes the viewsheds surrounding the businesses.

Turbine Option 1

Agricultural Productivity

Agricultural productivity would be directly impacted by operation of Turbine Option 1. The permanent conversion of land under Turbine Option 1 would constitute a negligible, long-term, unavoidable, limited to regional impact on agricultural activities in Benton County. Although livestock would be able to graze up to the turbines and associated structures under Turbine Option 1, measurable acreage would be taken out of agricultural management.

As shown in Table 2.1-1 of Chapter 2, Proposed Action and Alternatives, Turbine Option 1 would result in permanent land disturbance of 30 acres. This permanent impact on land represents less than 1 percent of the Lease Boundary's total acreage and less than 1 percent of the more than 21,216 agriculturally managed acres within the Lease Boundary.

Using 2020 and 2021 USDA wheat statistics for the State of Washington, Turbine Option 1 could reduce wheat yields in Benton County by 966 to 2,250 bushels for any given year. This analysis assumes that all 30 permanently impacted acres under Turbine Option 1 would be lost to production for the entire operations stage.

Loss of a single harvest season for approximately 30 acres would equate to less than 0.01 percent of Washington's annual wheat production.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by operation of Turbine Option 1. Under Turbine Option 1, the Project would generally dominate the existing landscape character through the introduction of vertical turbines. The turbines would be out of scale with the existing landscape. The greatest visual impacts would occur within the foreground distance zone. However, there are no wineries or agritourism businesses within the foreground distance zone.

Visual impacts that have the potential to occur within the middle ground distance zone would differ based on the extent of existing conditions. The middle ground distance zone is defined as 0.5 and 5 miles from the Lease Boundary. Due to differences in distance and location, indirect impacts on wineries and agritourism businesses located in the middle ground zone would vary. For example:

- For wineries and agritourism businesses with views of the existing Nine Canyon Wind Project, or where the existing transmission lines already dominate the viewshed, the Project would typically result in smaller changes to the landscape's existing character. For these locations, indirect impacts from the Project on the businesses' operations and profitability would be small and difficult to measure.
- For wineries located east of Benton City or southeast of the City of West Richland, where most of the vineyards and agritourism businesses are located, the Horse Heaven Hills would partially block views of the Project. For these wineries and agritourism businesses, indirect impacts from the Project on operations and profitability would be small and difficult to measure.

Due to the presence of turbines within the viewshed of wineries and agritourism businesses located in the middle ground distance zone, Turbine Option 1 would have a low, long-term, probable, and local indirect impact on their operations and profitability.

Turbine Option 2

Agricultural Productivity

Agricultural productivity would be directly impacted by operation of Turbine Option 2. The permanent conversion of land under Turbine Option 2 would constitute a negligible, long-term, unavoidable, limited to regional impact on agricultural production in Benton County. Impacts on agricultural activities under Turbine Option 2 would be similar to those presented for Turbine Option 1 for the Project's operations stage.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by operation of Turbine Option 2. Due to having fewer turbines, Turbine Option 2 would introduce a reduced level of contrast and fewer modifications to the existing landscape character than Turbine Option 1. However, due to the presence of turbines within the viewshed of wineries and agritourism businesses within the middle ground distance zone (0.5 to 5 miles from the Lease Boundary), operation of Turbine Option 2 would result in impacts similar to those described for Turbine Option 1.

Solar Arrays

Agricultural Productivity

Agricultural productivity would be directly impacted by operation of the solar arrays. The permanent conversion of land use associated with the operation of the solar arrays would constitute a low, long-term, unavoidable, limited to regional impact on agricultural production in Benton County. As noted, the ASC states that exclusionary fencing would be installed around the solar arrays. Exclusionary fencing would prevent the solar array areas from being used for agricultural activities throughout the Project's operation stage. This would result in a reduction in dryland wheat production and, potentially, a loss in grazing areas for livestock. Table 2.1-2 of Chapter 2, Proposed Action and Alternatives, shows that the combined permanent land disturbance from the three solar arrays would be 6,570 acres, the majority of which is currently being managed for agricultural purposes.

Using 2020 and 2021 USDA wheat statistics for the State of Washington, solar arrays could reduce wheat yields in Benton County between 211,554 and 492,750 bushels for any given year. This analysis assumes that all 6,570 permanently impacted acres under the solar arrays action would be lost to production for the entire operations stage. A loss of single harvest season for approximately 6,570 acres would equate to less than 0.3 percent of Washington's annual wheat production.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism are indirect impacts evaluated as part of the analysis from the operation of solar arrays. The presence of photovoltaic panels surrounded by agricultural lands would result in a visual contrast and changes in the landscape setting. The changes to the landscape setting would mainly impact viewing opportunities from within the foreground distance zone. Because no wineries or agritourism businesses are located within the foreground distance zone, operation of the solar arrays would result in negligible, long-term, unlikely, and local impacts on their operations and profitability.

Battery Energy Storage Systems

Agricultural Productivity

Agricultural productivity would be directly impacted by operation of the BESS. The permanent conversion of land as part of the operation of BESS would constitute a negligible, long-term, unavoidable, limited to regional impact on agricultural production in Benton County. Impacts on agricultural activities from the BESS would be similar to those presented for the Project's operations stage under Turbine Option 1. Table 2.1-2 of Chapter 2, Proposed Action and Alternatives, shows that the combined permanent land disturbance from the BESS would be approximately 18 acres.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism are indirect impacts evaluated as part of the analysis from the operation of BESS. Indirect impacts related to operation of the BESS would be similar to those anticipated for the operation of solar arrays.

Substations

Agricultural Productivity

Agricultural productivity would be directly impacted by operation of the substations. The permanent conversion of land as part of the operation of substations would constitute a negligible, long-term, unavoidable, limited to regional impact on agricultural production in Benton County. Impacts on agricultural activities from the substations would be similar to those presented for the Project's operations stage under Turbine Option 1. The conversion of agricultural land for the operation of substations would constitute a low, long-term, probable, confined impact on Benton County's Comprehensive Plan as the amount of agriculturally productive land would be reduced. Table 2.1-2 of Chapter 2, Proposed Action and Alternatives, shows that the combined permanent land disturbance from the BESS would be approximately 18 acres.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism are indirect impacts evaluated as part of the analysis from the operation of BESS. Indirect impacts related to operation of the substations would be similar to those of the proposed solar arrays and BESS.

Comprehensive Project

Agricultural Productivity

Agricultural productivity would be directly impacted by operation of the comprehensive Project. The permanent conversion of land under operation of the comprehensive Project would constitute a low to medium, long-term, unavoidable, limited to regional impact on agricultural production in Benton County. Impacts on agricultural activities from operation of the comprehensive Project would be similar to those presented for Turbine Option 1 and the solar arrays. However, when considering the impact of the comprehensive Project, the possibility for a conflict between the planned management of agricultural activities within the Lease Boundary and Project operations increases when compared with any individual component.

As shown in **Table 4.8-5**, 6,869 acres, or 9 percent, of the Lease Boundary would be permanently impacted by the comprehensive Project. Permanent impacts on land would effectively prevent further agricultural activities on those lands during the Project's operation stage. Of the 9 percent of the Lease Boundary's land that would be permanently impacted by the Project, 6,866 acres—or 99 percent—are currently being managed for agricultural purposes. The magnitude of impact is anticipated to remain low to medium, as the Project's operations would align with agricultural management plans.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by operation of comprehensive Project. Indirect impacts on wineries and agritourism businesses from the comprehensive Project would be similar to those described for Turbine Option 1. Under the comprehensive Project, energy infrastructure would generally dominate the existing landscape character through the introduction of vertical turbines. The greatest visual impacts would occur within the foreground distance zone. However, there are no wineries or agritourism businesses within the foreground distance zone. Visual impacts within the middle ground distance zone would differ based on the location of the viewpoint, surrounding structures and landscape, and location of the Project's visible components. Due to the presence of turbines within the viewshed of wineries and agritourism businesses located in the middle ground distance zone, Turbine Option 1 would have a low, long-term, probable, and local indirect impact on their operations and profitability. The magnitude rating would be potentially reduced for wineries and agritourism businesses whose customer focused experiences are directed away or located within areas that have existing barriers to viewing the Project.

4.8.2.3 Impacts during Decommissioning

Direct Impacts

Project decommissioning would result in temporary land disturbance of a type and magnitude similar to those described for Project construction. Temporarily disturbed lands would be restored to their original condition through grading and planting. Upon decommissioning, land use impacts from facility operations would be largely reversible.

The 2022 ASC states that decommissioning would be performed in accordance with EFSEC rules and prior site certification agreements and include dismantling and removing aboveground improvements, including turbines and solar modules, step-up transformers, substations, BESS, overhead generator tie lines and support structures, control hardware, and meteorological towers. Foundations would be removed to a level of no less than 3 feet below the surface of the ground unless requested to be maintained by the landowner. In areas where the foundations are removed, the surface would be restored and contoured to a condition reasonably similar to that prior to construction, and the area would be reseeded with vegetation reasonably acceptable to the landowner. Cables, lines, or conduit buried more than 3 feet below grade may not be removed (Horse Heaven Wind Farm, LLC 2022).

Once facilities were removed, acreage taken out of open space and rangeland use could be returned to these prior uses. An exception could be access roads, which local landowners may decide to continue to use and maintain.

Indirect Impacts

Wineries and agritourism would be impacted by decommissioning as heavy equipment would occupy portions of the landscape. The heavy equipment used to dismantle the turbines would contrast with the surrounding landscape as the structures are dismantled and the landscape is revegetated to preconstruction conditions. Once the turbines have been removed and the landscape revegetated, the views of the wineries and agritourism businesses would be restored to preconstruction conditions.

Turbine Option 1

Agricultural Productivity

Agricultural productivity would be directly impacted by decommissioning of Turbine Option 1. It is anticipated that decommissioning under Turbine Option 1 would result in negligible to low, temporary to short-term, unavoidable, and limited to regional impacts. Grazing and farming operations would be impacted by the presence of heavy equipment and construction workers on site and on the connecting roadways. No permanent land use impacts would result from decommissioning of turbines under Turbine Option 1. The Applicant would be required to comply with the decommissioning requirements of the site certification agreement. It is anticipated that most of the permanently disturbed lands would be restored and available for future agricultural use.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by decommissioning of Turbine Option 1. As analyzed in Section 4.10**,** viewpoints and KOPs located within the foreground distance zone would experience the greatest impacts from decommissioning under Turbine Option 1. The decommissioning of access roads, crane paths, collector and communication lines, and wind turbines would be noticeable when viewed within the foreground distance zone. However, there are no wineries or wine-tasting sites within the foreground distance zone. Indirect impacts on wineries and wine-tasting tourism from decommissioning under Turbine Option 1 would be low, short term, feasible, and local.

Turbine Option 2

Agricultural Productivity

Agricultural productivity would be directly impacted by decommissioning of Turbine Option 2. It is anticipated that if Turbine Option 2 were decommissioned, impacts would be negligible to low, temporary to short term, unavoidable, and limited to regional. No permanent land use impacts would result from decommissioning of turbines under Turbine Option 2. The Applicant would be required to comply with the decommissioning requirements of the site certification agreement. It is anticipated that most of the permanently disturbed lands would be restored and available for future agricultural use.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by decommissioning of Turbine Option 2. Indirect impacts on wineries and agritourism from the decommissioning of Turbine Option 2 would be similar to those under Turbine Option 1.

Solar Arrays

Agricultural Productivity

Agricultural productivity would be directly impacted by solar array decommissioning. Decommissioning of the solar arrays would constitute a low, temporary to short-term, unavoidable, limited to regional impact. Grazing and farming operations would be impacted by the presence of heavy equipment and construction workers on site and connecting roadways. As acreage would have already been taken out of dryland wheat production, it is anticipated that impacts from decommissioning of the solar arrays would be less than those described for construction. No permanent land use impacts would result from decommissioning of the solar arrays. The Applicant would be required to comply with decommissioning requirements of the site certification agreement. It is anticipated that most of the permanently disturbed lands could be restored and available for future agricultural use.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by decommissioning of the solar arrays. Decommissioning of the solar arrays would occur within a smaller, more defined area associated with the selected solar array areas of the Lease Boundary. Decommissioning of the solar arrays would mainly impact viewing opportunities located within the foreground distance zone. Because no wineries or agritourism businesses are located within the foreground distance zone, decommissioning of the solar arrays would result in negligible, short-term, unlikely, and local indirect impacts.

Battery Energy Storage Systems

Agricultural Productivity

Agricultural productivity would be directly impacted by BESS decommissioning. Decommissioning of the BESS would constitute a negligible to low, temporary to short-term, unavoidable, limited to regional impact. Grazing and farming operations would be impacted by the presence of heavy equipment and construction workers on site and on the connecting roadways. No permanent land use impacts would result from decommissioning of the BESS. The Applicant would be required to comply with the decommissioning requirements of the site certification agreement. It is anticipated that most of the permanently disturbed lands could be restored and available for future agricultural use.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by decommissioning of the BESS. Indirect impacts related to decommissioning of the BESS would be similar to those described for the solar arrays.

Substations

Agricultural Productivity

Agricultural productivity would be directly impacted by substation decommissioning. Decommissioning of the substations would constitute a negligible to low, temporary to short-term, unavoidable, limited to regional impact. Grazing and farming operations would be impacted by the presence of heavy equipment and construction workers on site and connecting roadways. No permanent land use impacts would result from decommissioning of the substations. The Applicant would be required to comply with decommissioning requirements of the site certification agreement. It is anticipated that most of the permanently disturbed lands could be restored and available for future agricultural use.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by decommissioning of the substations. Indirect impacts related to decommissioning of the substations would be similar to those described for the solar arrays.

Comprehensive Project

Agricultural Productivity

Agricultural productivity would be directly impacted by decommissioning of the comprehensive Project. Decommissioning of the comprehensive Project would constitute a low, temporary to short-term, unavoidable, limited to regional impact. Grazing and farming operations would be impacted by the presence of heavy equipment and construction workers onsite and on the connecting roadways. As acreage would have already been taken out of dryland wheat production for solar array construction, it is anticipated that impacts from the decommissioning of the comprehensive Project would be less than those described for construction. No permanent land use impacts would result from decommissioning of the comprehensive Project. The Applicant would be required to comply with the decommissioning requirements of the site certification agreement. It is anticipated that most of the permanently disturbed lands could be restored and available for future agricultural use.

Profitability of Wineries and Agritourism

Profitability of wineries and agritourism may be indirectly impacted by decommissioning of the comprehensive Project. The decommissioning and removal of the comprehensive Project would have visual impacts similar to those of the construction stage. The removal of Project components would likely require additional ground disturbance and vegetation clearing, resulting in reclamation efforts. However, over time the landscape impacted by the Project would begin to resemble preconstruction conditions.

During the decommissioning of the comprehensive Project, there would be indirect impacts from decommissioning activities. These decommissioning activities would be related to the removal of wind turbines, solar arrays, the O&M facility, transmission lines, BESS, substations, and other areas disturbed during construction and operation of the Project.

Viewpoints located within the foreground distance zone would experience the greatest impacts from decommissioning of the comprehensive Project. This would particularly occur when a large portion of the viewshed is occupied by the decommissioning of multiple components simultaneously. Because no wineries or agritourism businesses are located within the foreground distance zone, decommissioning of the comprehensive Project would result in low, short-term, feasible, and local indirect impact on the operations and profitability of wineries and agritourism businesses near the Project. The magnitude rating would be potentially reduced for wineries and agritourism businesses whose customer focused experiences are directed away or located within areas that have existing barriers to viewing the Project. BESS

4.8.2.4 Recommended Mitigation Measures

This section describes the measures that would reduce or compensate for impacts related to land use from construction, operation, and decommissioning of the Project. EFSEC has identified the following mitigation measures for the Project to avoid and/or minimize potential impacts related to Land and Shoreline Use. These measures would be implemented in addition to the setback requirements detailed in Benton County Code 11.17.070 (as presented in Appendix 3.8-1) and compliance with environmental permits, plans, and authorizations required for the Proposed Action.

LSU-1:[42] The Applicant would prepare a livestock management plan with property owners and livestock owners to control the movement of animals within the Lease Boundary during construction, operation and decommissioning.

Rationale: To limit conflicts between the Project and farmers and ranchers.

LSU-2: The Applicant would prepare a dryland farming management plan for construction, operation, and decommissioning that outlines communication requirements between the Certificate Holder and the land owners. The plan would establish work windows that would allow farmers uninterrupted access to their fields for dryland wheat planting and harvesting.

Rationale: To limit conflicts between the Project and farmers and ranchers.

LSU-3: The Applicant would be responsible for ensuring that arrangements for the removal of all livestock have been made during Project construction and decommissioning.

Rationale: To limit conflicts between the Project and farmers and ranchers.

LSU-4: After construction is completed, the Applicant would restore all temporary disturbance areas to their preconstruction status.

Rationale: This measure would allow the areas of temporary disturbance within the Lease Boundary to return to their preconstruction agricultural production levels as soon as possible.

LSU-5: Prior to decommissioning, the Applicant would submit a Detailed Site Restoration Plan, per WAC 463-72-050, for restoring the site to its preconstruction character. The Applicant would be responsible for working with the landowner to return all agricultural land to its preconstruction status. If future site conditions or land ownership no longer allows for the land to be returned to agricultural production, the Applicant would submit a request to EFSEC for an alternative land use that would be in alignment with the Lease Boundary's preconstruction rural character and resource value. If the Detailed Site Restoration Plan requests an alternative land use, EFSEC may require that the Applicant provide additional mitigation to offset impacts from a permanent conversion of the land.

[42] LSU-: Identifier of numbered mitigation item for Land and Shoreline Use

Rationale: This measure would assist in preventing conversion of a land use that is not in alignment with the Lease Boundary's current designation.

4.8.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would occur.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and consider undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[43]

[43] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remain. The additional Applicant commitments identified above do not change the impact ratings previously provided for land and shoreline use in the Draft EIS, and the impact ratings remain the same.

4.8.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This Environmental Impact Statement weighs the potential impacts on land and shoreline use that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.8-6a, 4.8-6b, and 4.8-6c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to land and shoreline use.

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Table 4.8-6a: Summary of Potential Impacts on Land and Shoreline Use during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Agriculture (Productivity)	Turbine Option 1 Turbine Option 2 BESS Substations	It may be necessary to remove cattle from areas where blasting or heavy equipment operations take place. Project construction could delay agricultural activities for short durations on adjacent properties. Reduced access to fields within the Lease Boundary could impact existing dryland agricultural management programs. Limited but measurable acreage would be taken out of wheat production.	Negligible (farm plan modifications) Low (decreased productivity)	Temporary (brief access modifications) Short Term (seasonal restrictions)	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan **LSU-3:** Arrange for the removal of livestock	None identified
Agriculture (Productivity)	Solar Arrays	It may be necessary to remove cattle from areas where heavy equipment operations take place. Project construction could delay agricultural activities for short durations on adjacent properties. Reduced access to fields within the Lease Boundary could impact existing dryland agricultural management programs. Temporarily and permanently impacted dryland agricultural acreage from solar array construction would equate to approximately 0.3% of the state's annual wheat production.	Low	Temporary (brief access modifications) Short Term (seasonal restrictions)	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan **LSU-3:** Arrange for the removal of livestock	None identified
Agriculture (Productivity)	**Comprehensive Project**	Similar to Turbine Option 1 and solar arrays	Low (decreased productivity) Medium (operational changes)	Temporary (brief access modifications) Short Term (seasonal restrictions)	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan **LSU-3:** Arrange for the removal of livestock	None identified
Wineries and agritourism (Profitability)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Wineries and agritourism businesses could be impacted from changes in general environmental settings through potential changes in viewing opportunities.	Low	Short Term	Feasible	Local	No mitigation identified	None identified
Wineries and agritourism (Profitability)	Solar Arrays BESS Substations	The construction of the solar arrays would occur within a smaller, more defined area associated with the selected solar array site, resulting in negligible impacts.	Negligible	Short Term	Unlikely	Local	No mitigation identified	None identified

Notes:
[a] The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[d] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.8-6b: Summary of Potential Impacts on Land and Shoreline Use during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Agriculture (Productivity)	Turbine Option 1 Turbine Option 2 BESS Substations	Although livestock would be able to graze up to turbines and associated structures, limited but measurable acreage would remain out of agricultural production.	Negligible	Long Term	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan	None identified
Agriculture (Productivity)	Solar Arrays	Exclusionary fencing would be installed around the solar arrays. Exclusionary fencing would prevent the solar array areas from being used for agricultural activities throughout the Project's operations stage. The loss of available farmland would result in a reduction in dryland wheat production and, potentially, a loss in grazing areas for livestock.	Low	Long Term	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan	None identified
Agriculture (Productivity)	**Comprehensive Project**	Impacts on agricultural activities from operation of the comprehensive Project would be similar to those presented for Turbine Option 1 and the solar arrays. However, when considering the impact of the comprehensive Project, the possibility for a conflict between the planned management of agricultural activities within the Lease Boundary and Project operations increases when compared with any individual component.	Low (decreased productivity) Medium (operational changes)	Long Term	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan	None identified
Wineries and agritourism (Profitability)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Changes in landscape character through the introduction of turbines that could be seen from wineries and agritourism businesses would indirectly impact wine-tasting tourism.	Low	Long Term	Probable	Local	**VIS-1–VIS-9** For details on these mitigation measures, refer to Section 4.10	None identified
Wineries and agritourism (Profitability)	Solar Arrays BESS Substations	The conversion of existing agricultural lands to energy infrastructure would result in visual contrast and changes in the landscape setting. Due to the location of the solar arrays, BESS, and substations, the changes may not be visible from the wineries and agritourism businesses.	Negligible	Long Term	Unlikely	Local	**VIS-1–VIS-9** For details on these mitigation measures, refer to Section 4.10	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
ASC = Application for Site Certification; BESS = battery energy storage system; EFSEC = Washington Energy Site Evaluation Council

Table 4.8-6c: Summary of Potential Impacts on Land and Shoreline Use during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Agriculture (Productivity)	Turbine Option 1 Turbine Option 2 BESS Substations	Similar to the construction stage	Negligible (farm plan modifications) Low (decrease productivity)	Temporary (brief access modifications) Short Term (seasonal restrictions	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan **LSU-3:** Arrange for the removal of livestock **LSU-4:** Confirm that site restoration activities are in alignment with the Applicant's decommissioning plan **LSU-5:** Requirements for requesting an alternative land use as part of decommissioning	None identified
Agriculture (Productivity)	Solar Arrays **Comprehensive Project**	Impacts would be less than those described for the construction stage as dryland wheat production located within the solar array area would have previously been taken out of management.	Low	Temporary (brief access modifications) Short Term (seasonal restrictions)	Unavoidable	Limited (small area) Regional (decreased productivity)	**LSU-1:** The Applicant would prepare a livestock management plan **LSU-2:** The Applicant would prepare a dryland farming management plan **LSU-3:** Arrange for the removal of livestock **LSU-4**: Confirm that site restoration activities are in alignment with the Applicant's decommissioning plan **LSU-5:** Requirements for requesting an alternative land use as part of decommissioning	None identified
Wineries and agritourism (Profitability)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Decommissioning of access roads, crane paths, collector and communication lines, and wind turbines could impact viewing opportunities from wine-tasting sites and as result wine-tasting tourism.	Low	Short Term	Feasible	Local	No mitigation identified	None identified
Wineries and agritourism (Profitability)	Solar Arrays BESS Substations	Decommissioning of the solar arrays, BESS, and substations could impact viewing opportunities from the wineries and agritourism businesses as decommissioning activities occur within the viewshed.	Negligible	Short Term	Unlikely	Local	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system

4.8.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to land use from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.9 Historic and Cultural Resources

This section evaluates the impacts on historic and cultural resources within the Area of Analysis that could result from the proposed Horse Heaven Wind Farm (Project, or Proposed Action). The Area of Analysis comprises land within the Horse Heaven Wind Farm, LLC's (Applicant's) Lease Boundary totaling 72,428 acres and includes the proposed Wind Energy Micrositing Corridor of approximately 11,850 acres (of predominantly linear features, including the turbines, support infrastructure, etc.) and the Solar Siting Areas, which encompass approximately 10,755 acres (Horse Heaven Wind Farm, LLC 2022: p. 2-1). The historic and cultural resources considered as part of this assessment include archaeological resources,[44] architectural resources, and traditional cultural properties (TCPs), as identified in Section 3.9.

Under the Washington State Environmental Policy Act (SEPA), this Environmental Impact Statement (EIS) weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when evaluating potential impacts (WAC 197-11-330 and WAC 197-11-794). These impacts were qualitatively assessed based on the method of analysis described in Section 4.9.1 below. Additionally, the qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and summarized in **Table 4.9-1**. Although the use of the impact scale and a qualitative assessment of impacts is not typical for historic and cultural resources, this EIS is intended to comply with SEPA requirements.

4.9.1 Method of Analysis

Potential impacts on historic and cultural resources are considered during the following Project stages:

- Project construction
- Project operation
- Project decommissioning

The Project includes several subcomponents—wind turbines within the Micrositing Corridor, solar arrays, and substations and associated battery energy storage systems (BESS). Potential impacts from the subcomponents are assessed separately below.

- **Wind Turbines.** For the wind turbine portion of the Project, the Applicant is considering multiple turbine sites. According to the information provided by the Applicant to date, it is expected that the Project's impacts on historic and cultural resources would be similar for Turbine Option 1 and Turbine Option 2, though it is recognized that the proposed turbine locations would differ in impact. For this reason, Turbine Options 1 and 2 were assessed the same, with the assumption of the highest potential impact from either option. As the final Project design and layout are still under development, potential impacts are considered to occur throughout the Micrositing Corridor.
- **Solar Arrays.** Three Solar Siting Areas are considered for the proposed placement of the solar arrays:
  - East Solar / Bofer Canyon
  - West Solar 1 / County Well Road

[44] To avoid confusion between historic-period archaeological resources and historic archaeological resources, this document does not use the latter term. Any NRHP-listed or eligible properties should be understood to be historic archaeological resources, per WAC 25-48-020(11).

- West Solar 2 / Sellards Road

At this stage of the Project design, and to aid future refinement, impacts are considered to occur throughout these defined areas (rather than in discrete portions of each area).

- **BESS and Associated Substations.** The substations and adjacent BESS are subcomponents at six proposed locations:
  - HH-East Substation
  - HH-West Intermediate Substation (Primary – Badger Canyon Road)
  - HH-West Intermediate Substation (Alternate – County Well Road)
  - HH-West Step-Up Substation 500 kV (Primary – Sellards Road)
  - HH-West Step-Up Substation 500 kV (Alternate – County Well Road)
  - HH-West Alternate Solar Substation

  Due to their adjacency, the impacts of the substations and BESS on historic and cultural resources are assessed together for each Project stage.

This evaluation of potential interactions between Project subcomponents and activities and the historic and cultural resources in the Area of Analysis relies primarily on information provided in the Application for Site Certification (ASC) for the Project (Horse Heaven Wind Farm, LLC 2022) and Section 2.1 of this EIS. Information on the historic and cultural resources located in the Project Lease Boundary vicinity was gathered during cultural resource surveys conducted by the Applicant's cultural resource consultant, Historical Research Associates, Inc. (HRA). This information is summarized in Section 3.9 and includes the historic and cultural resource types, their eligibility for listing in the National Register of Historic Places (NRHP) as appropriate, and the regulatory context for the identification and protection of historic and cultural resources. Section 3.9 also includes recommendations made by HRA for avoidance of, and potential Project impacts on, historic and cultural resources, as well as a summary of consultation between the Washington Energy Facility Site Evaluation Council (EFSEC) and the Washington Department of Archaeology and Historic Preservation (DAHP).

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize Project impacts on historic and cultural resources, and these are outlined in the Final ASC (Horse Heaven Wind Farm, LLC 2023). Measures proposed by the Applicant are:

- Cultural Resource Worker Education/Training
- Preconstruction Survey and Cultural Resource Avoidance Plan
- Inadvertent Discovery of Archaeological Resources during Construction Plan

Applicant Commitments have been taken into consideration in the characterization of potential impacts on historic and cultural resources in Section 4.9.2. Commitments proposed by the Applicant are discussed in Section 2.1.3.11 and summarized below.

Cultural Resource Worker Education/Training

The Applicant would retain a qualified archaeologist to provide a cultural resource briefing prior to construction. The briefing would include an explanation of all applicable laws and penalties pertaining to disturbance(s) to cultural resources. The briefing would summarize the regional context for historic and cultural resources, the archaeological sensitivity of the area, and types of historic and cultural resources found in the area. The briefing would instruct Project personnel to halt construction in the event of an inadvertent discovery of historic and cultural resources during construction. Inadvertent discovery procedures including appropriate treatment and respectful behavior of an inadvertent discovery are discussed under Inadvertent Discovery Plan, below.

If requested, a Tribal representative(s) shall be invited to participate in the cultural resource briefing. The Tribal representative(s) could discuss historic and cultural resources within the region and/or provide text from a Tribal perspective regarding such resources (Horse Heaven Wind Farm, LLC 2023: p. 4-156 to 4-157).

Preconstruction Survey and Cultural Resource Avoidance Plan

The Applicant would retain a qualified archaeologist to prepare and implement a Cultural Resource Preconstruction Survey and Avoidance Plan. The plan would provide protocols for preconstruction survey(s) of areas that have not been previously surveyed, including, but not limited to, areas added as a result of final design or construction needs.

The Cultural Resource Avoidance Plan, described in detail below, would be implemented to avoid known historic and cultural resources. Tribal representatives would also be invited to monitor Project-related construction activities. The Applicant's consultant, Historical Research Associates, Inc. (HRA), submitted a draft Cultural Resources Monitoring Plan in May 2023 (Davis and Ragsdale 2023a).

A Archaeological Excavation and Removal Permit is required for any alteration to any precontact archaeological site regardless of the level of disturbance. For historic-period archaeological sites, permits are only required for removal or excavation of sites that are unevaluated for, eligible for, or listed in the NRHP.

Cultural Resource Avoidance Plan

The Cultural Resource Avoidance Plan would outline avoidance measures for historic and cultural resources. Historic and cultural resources identified within the Lease Boundary would be avoided by the Project through modification of Project design. Avoidance measures would also include construction buffers, protective signage or flagging, and cultural resource monitoring. HRA submitted a draft Cultural Resources Monitoring Plan to the Applicant in May 2023 (Davis and Ragsdale 2023a).

Resource boundaries for precontact resources identified within the Lease Boundary include a 66-foot (-meter) buffer for Sites **45BN261** and **45BN2090** and a 33-foot (10-meter) buffer for isolates **45BN2092** and **45BN2146** and multicomponent site **45BN2153**. If a resource cannot be avoided, a qualified archaeologist would coordinate with DAHP and the Tribes regarding additional archaeological investigation and/or mitigation measures, as appropriate.

Inadvertent Discovery of Archaeological Resources During Construction Plan

The Applicant would retain a qualified archaeologist to prepare an IDP prior to ground-disturbing activities. In the event of an inadvertent discovery during Project construction, all activity in the vicinity of the find would stop and a qualified archaeologist would be contacted to evaluate the eligibility of the resource for listing in NRHP (for historic-period resources) or to conduct other appropriate investigations per RCW 27.53 (for precontact resources). A DAHP-issued archaeological permit would be obtained, if necessary, for any archaeological investigations of inadvertent discoveries. For any NRHP-eligible historic-period archaeological resources, and all precontact archaeological resources, the archaeologist would coordinate with the implementing agencies, the Washington Department of Natural Resources (where appropriate), and affected Tribes to formulate avoidance measures, archaeological data recovery, and/or appropriate measures (Davis and Ragsdale 2023b).

If evidence of human burials is encountered, all ground-disturbing activity in the vicinity would be halted immediately. No work would resume within an IDP-defined buffer with no less than a 98-foot (30-meter) radius until all appropriate approvals had been received. Inadvertent discoveries of human skeletal remains are subject to the procedures for notification and disturbance required by RCW 68.60.055. HRA submitted a draft IDP to the Applicant in May 2023 (Davis and Ragsdale 2023b).).

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.9.2.5, Post-Adjudication Applicant Commitments.

Avoidance of historic and cultural resources is the preferred course of action. RCW 27.44 forbids disturbance of Native American burial sites, and RCW 27.53.060 requires permits from DAHP before disturbance of archaeological resources (see Section 3.9).

The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and shown in **Table 4.9-1**. The impact scale was developed for this EIS, and it is not based on a published source. The impact scale provides a standardized approach to assess significant impacts across all resource topics for the Project. The following was developed to assist EFSEC in their determination of significance and to contextualize the impact scale within state cultural resource laws (Revised Code of Washington [RCW] 27.53) and SEPA rules (WAC 197-11-080).

Impact ratings were assessed conservatively due to the nature of historic and cultural resources, which are finite and irreplaceable. In addition, eligibility for listing in the NRHP has not been evaluated for several historic and cultural resources in the Area of Analysis. The conservative approach to impact ratings conforms with WAC 197-11-080 (SEPA rules: Incomplete or unavailable information), which stipulates that if information on significant adverse impacts is unavailable, the lead agency under SEPA shall proceed with a worst-case analysis.

Table 4.9-1: Impact Rating Scale from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

The qualitative rating system described in Section 4.1 was used to assess the extent of Project-related impacts on historic and cultural resources according to the following attributes:

- **Magnitude** – Would the impact result in a direct or indirect alteration to the characteristics that would qualify the resource for inclusion in the NRHP? What is the resource sensitivity? Are Project-related impacts on historic and cultural resources negligible, low, medium, or high in terms of their severity?
- **Duration** – Is the impact temporary, short term, long term, or constant? Some impacts (e.g., removal or destruction) on resources would be irreversible and therefore, in this analysis, constant.
- **Likelihood** – Are the potential impacts on historic and cultural resources unlikely, feasible, probable, or inevitable? When the intent of the Applicant's Cultural Resource Avoidance Plan is to avoid the identified resource, likelihood is assessed as unlikely. If there is the potential for the environmental setting of a culturally sensitive resource to be adversely affected (e.g., noise, vibration, and visual interferences) regardless of avoidance through the Applicant's Cultural Resource Avoidance Plan, the likelihood will be assessed as appropriate.
- **Spatial Extent** – Are impacts potentially confined to a small area (i.e., a single archaeological resource), or do they extend beyond the local area to viewsheds beyond the Lease Boundary?

As identified in **Table 4.9-2**, the magnitude of an impact is determined based on adverse effects on the historic and cultural resources and the sensitivity of the resources.

Table 4.9-2: Criteria for Assessing Magnitude of Impacts on Cultural and Historic Resources

Magnitude of Impacts	Description
Negligible	**Adverse Effects:** No adverse effects on impacted resources. **Resource Sensitivity:** Impacted resources are either historic-period archaeological resources or architectural resources, and impacted resources have been determined not eligible for the NRHP.
Low	**Adverse Effects:** Adverse effects on impacted resources are unlikely. **Resource Sensitivity:** Impacted resources are NRHP-eligible architectural resources that DAHP believes will not be physically impacted by the Project.
Medium	**Adverse Effects:** Potential for adverse effects on impacted resources. **Resource Sensitivity:** Impacted resources are historic-period archaeological sites that have not been evaluated for the NRHP.
High	**Adverse Effects:** Adverse effects on impacted resources. **Resource Sensitivity:** Impacted resources are either precontact archaeological resources (sites and isolates), NRHP-eligible historic-period archaeological resources, TCPs, or unidentified historic and cultural resources

DAHP = Washington State Department of Archaeology and Historic Preservation; NRHP = National Register of Historic Places; TCP = traditional cultural property

Adverse effects consist of direct or indirect alteration of the characteristics that would render a resource eligible for inclusion in the NRHP. Eligibility is based on significance under one or more of four criteria established by the National Historic Preservation Act. To be eligible, a resource must also possess integrity (NPS 1997; Hardesty and Little 2000) (see Section 3.9).

This EIS considers all potential impacts that could have adverse effects, in line with guidance provided by the Advisory Council on Historic Properties (2019), including:

- Direct effects, which result from an immediate interaction between a planned Project activity and the receiving receptors, free from extraneous influence, (i.e., partial or complete destruction of an archaeological feature or cultural site, changes to viewshed, or loss of access to TCPs).
- Indirect effects, which are secondary, occurring later in time or farther from the activity causing the interaction (i.e., mitigation measures installed for a different impact affecting historic and cultural resources).

Adverse effects are considered with respect to the eligibility of historic and cultural resources for the NRHP. Precontact archaeological isolates and TCPs may not have been evaluated for the NRHP and thus not subject to the magnitude criteria for adverse effects. However, DAHP and the Confederated Tribes and Bands of the Yakama Nation [Yakama Nation] have requested avoidance and/or additional measures for such historic and cultural resources. Conversely, some NRHP-eligible resources, such as architectural resources, may not be impacted by the Project. Therefore, resource sensitivity is also considered when assessing the magnitude of impacts. Resource sensitivity is based on NRHP eligibility, Washington State regulations on historic and cultural resources, DAHP consultation, and/or coordination with the Tribes.[45] For the intent of this analysis, resource sensitivity takes into account that:

- DAHP has stated that architectural resources identified within the Area of Analysis will not be physically impacted by the Project. Pending changes to the Project's scope of work, DAHP has no concerns regarding architectural resources within the Area of Analysis (Hanson 2021b).
- RCW 27.53 protects historic-period archaeological sites that are eligible or unevaluated for the NRHP, as well as all precontact archaeological sites, regardless of NRHP eligibility. Disturbance to such archaeological resources requires a DAHP-issued permit.
- The Yakama Nation has requested avoidance of all archaeological resources, particularly precontact archaeological isolates, which are not protected under RCW 27.53. DAHP has recommended avoidance of precontact isolates (Hanson 2021a, 2021b).
- Information on TCPs within the Area of Analysis is limited or confidential.
- The Yakama Nation has requested the protection, preservation, and perpetuation of TCPs and archaeological resources.
- Archaeological surveys have been conducted within the Area of Analysis. However, no archaeological survey is fully comprehensive. For this reason, unidentified historic and cultural resources may exist within the Area of Analysis.

In terms of significant impacts on historic and cultural resources, the worst-case scenario would be their loss through destruction or irreparable damage because such resources cannot be moved, reproduced, or replaced. To conform with the conservative approach required by WAC 197-11-080, all TCPs have a high magnitude rating because the potential for significant impacts on these resources is unknown, requiring a worst-case analysis.[46] Unidentified historic and cultural resources have an elevated resource sensitivity, and therefore a high magnitude rating, due to the potential severity of their loss.

4.9.2 Impacts of Proposed Action

4.9.2.1 Impacts during Construction

Impacts on historic and cultural resources are anticipated during construction of turbines, solar arrays, substations and BESS, and the comprehensive Project. The magnitude of impacts could range from negligible to high, based on the resource sensitivity and the extent of adverse effects, both direct and indirect, on historic and cultural resources (see 4.9.1 Method of Analysis). For impacts during construction, resource sensitivity is of highest concern for precontact archaeological resources (sites and isolates), TCPs, and unidentified historic and cultural resources.

The magnitude of the impacts discussed below would be medium or high if the impacts destroyed or diminished the integrity of a resource (adverse effects). Specifically, impacts to the location, setting, feeling, and/or

[45] The use of "Tribes" in this context is inclusive of the Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Wanapum Tribe.

[46] Continued conversations with the affected Tribes (Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Wanapum Tribe) could provide more detailed information about potential significant impacts on TCPs. Ongoing engagement regarding potential significant impacts may provide mitigation measures to employ for TCPs. The impact significance rating may change as a result of continued engagement with the Tribes.

association of a resource through changes to baseline environmental conditions (noise, dust, vegetation, etc.) could adversely affect its integrity. Restriction of access to TCPs could result in a high-magnitude impact. Viewshed alterations through the construction of turbines and/or the use of large equipment and heavy machinery could result in high-magnitude impacts on TCPs. Viewsheds are analyzed in Section 4.10 of this EIS and include key observation points identified by the Yakama Nation for analysis.

Turbine Option and Turbine Option 2

Impacts on historic and cultural resources from the construction of turbines and associated supporting infrastructure would occur within the Micrositing Corridor. Impacts may result in the destruction of or damage to historic and cultural resources through ground disturbance and physical alteration. Activities with such impacts include:

- Surface grading
- Surface clearance
- Construction of access roads, turnaround areas, and laydown areas
- Construction of tower foundations
- Construction of supporting infrastructure (e.g., meteorological stations, transformers, and underground cables)

Impacts from turbine construction activities associated with noise, vibration, visual interferences, and restriction of access could have adverse effects on historic and cultural resources through a loss or diminishment of integrity. Activities with such impacts include:

- Construction traffic that creates or exacerbates noise
- Construction traffic that creates or exacerbates dust
- Vegetation clearance
- Fencing
- Land acquisition
- Erection of turbines
- Use of large equipment and heavy machinery

A total of 28 historic and cultural resources have been identified within the Micrositing Corridor, including 21 archaeological resources and seven architectural resources (Section 3.9) (Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021).[47] In addition, discussions with the affected Tribes have identified TCPs within or near the Micrositing Corridor (Section 3.9). The Cultural Resource Avoidance Plan and the Inadvertent Discovery Plan (IDP) for

[47] Horse Heaven Wind Farm, LLC (2022: p. 4-157, Table 4.2.5-3. HRA Recommendations for Archaeological Resources within the Project) erroneously reports that all 41 archaeological resources are located within the Micrositing Corridor. This Final EIS presents the correct information regarding historic and cultural resources identified within the Area of Analysis by HRA (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021; Tuck et al. 2023).

historic and cultural resources are discussed in Section 4.9.2. A summary of potential impacts on historic and cultural resources during turbine construction is presented in **Table 4.9-3**.

Four precontact-period archaeological resources have been identified within the Micrositing Corridor (**Table 4.9-3**):

- **45BN261** (Precontact archaeological site)
- **45BN2090** (Precontact archaeological site)
- **45BN2092** (Precontact archaeological isolate)
- **45BN2153** (Precontact component of archaeological site)

Per RCW 27.53, precontact archaeological Sites **45BN261** and **45BN2090** and the precontact component at Site **45BN2153** require a permit issued by DAHP prior to disturbance. Although RCW 27.53.060 does not protect precontact isolate **45BN2092**, the Yakama Nation has requested avoidance of this resource. In addition, DAHP has recommended avoidance of precontact archaeological isolates (Hanson 2021b). Given the resource sensitivity of precontact archaeological resources, the magnitude of impacts on these resources would be high. The duration of impact would be constant beyond the life of the Project. The likelihood of impacts on precontact archaeological resources within the Micrositing Corridor is rated as unlikely, given the Cultural Resource Avoidance Plan. The spatial extent would be confined.

Ten historic-period archaeological resources (sites and isolates) and three architectural resources in the Micrositing Corridor have been determined not eligible for the NRHP (**Table 4.9-3**). Avoidance of the 10 historic-period archaeological resources is not required by DAHP. DAHP stated that the Project would not physically impact any identified architectural resources and, therefore, DAHP has no concerns about architectural resources (Hanson 2021b). For all historic and cultural resources determined not eligible for the NRHP, the magnitude of impact would be negligible. The impact duration would be constant beyond the life of the Project. The likelihood of impacts on these resources is probable. The spatial extent of impacts would be confined for the historic-period archaeological resources and local for the architectural resources.

Eleven historic-period archaeological sites and the historic component of one multicomponent archaeological site in the Micrositing Corridor are unevaluated for listing in the NRHP (**Table 4.9-3**). The magnitude of impact on these resources is high due to the potential for adverse effects (direct and indirect) as well as the resource sensitivity. With the Applicant’s stated intent for the Cultural Resource Avoidance Plan being to avoid identified resources, the likelihood of impacts from turbine construction is considered unlikely. If impacts were to occur, the duration would be constant beyond the life of the Project, and the spatial extent would be confined.

Four architectural resources within the Micrositing Corridor have been determined eligible for the NRHP (**Table 4.9-3**):

- **721666** (McNary–Franklin No. 2 Transmission Line)
- **722995** (Grain elevator)
- **724937** (Nicoson Road Farmstead Barn Storage Building)
- **724938** (Nicoson Road Farmstead Cribbed Grain Elevator)

DAHP has stated that the Project would not physically impact any identified architectural resources and, as such, DAHP has no concerns about architectural resources (Hanson 2021b). DAHP requested notice should the Project scope of work include physical impacts to any of the identified architectural resources (Hanson 2021b). Based on DAHP's review, the magnitude of impacts for the four NRHP-eligible architectural resources within the Micrositing Corridor would be negligible. Impacts from noise, dust, and use of large equipment and heavy machinery would have short-term duration. Impacts from the construction of turbines would be constant beyond the life of the Project due to the effect of the turbines on the viewshed of the architectural resources. For all impacts, the likelihood would be unlikely, and the spatial extent would be regional.

If any physical alterations did occur to the four NRHP-eligible architectural resources, the magnitude of impact would be high, and the duration would be constant beyond the life of the Project. With the Project's scope of work, impacts would be unlikely. The spatial extent/setting of such impacts would be regional (see **Table 4.9-3**).

For unidentified historic and cultural resources within the Micrositing Corridor, impacts would be high in magnitude, in compliance with the worst-case analysis stipulated by WAC 197-11-080. Impacts would be constant in duration, and feasible in terms of their likelihood. Spatial extent is assumed to be local because unidentified historic and cultural resources adjacent to the proposed Lease Boundary could be impacted.

The presence of TCPs within the Lease Boundary has been confirmed through coordination with the Tribes. Information on the presence and location of TCPs within the Micrositing Corridor, specifically limited and confidential. In compliance with the worst-case analysis stipulated by WAC 197-11-080, the magnitude of impact on TCPs within the Micrositing Corridor would be high. Impact duration would be short term for noise, dust, and use of large equipment and heavy machinery. The construction of turbines and fencing and the acquisition of land would have a constant impact on TCPs due to effects on viewsheds, access, and destruction of the resources themselves. The likelihood of impacts is rated as unavoidable, given that TCPs are known to exist within the Lease Boundary. The spatial extent of impacts on TCPs would be regional.

Table 4.9-3: Potential Impacts from Turbine Construction

Resource Sensitivity	Resource Type	Resource ID	Potential Impact(s) and Applicant Commitments	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
DAHP-issued permit required prior to disturbance	Archaeological Resources: Precontact or multicomponent sites	▪ 45BN261 ▪ 45BN2090 ▪ 45BN2153 (Precontact component)	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	unavoidable	Confined
Avoidance requested and recommended	Archaeological Resources: Precontact isolate	▪ 45BN2092	Destruction of or damage to resource through ground disturbance and physical alteration; adverse effects on resource through a loss or diminishment of integrity Resource to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	Unlikely	Confined
Determined Not Eligible for the NRHP	Archaeological Resources ▪ : Historic Isolates and Sites-period archaeological sites or isolates	▪ 45BN2081 ▪ 45BN2082 ▪ 45BN2083 ▪ 45BN2084 ▪ 45BN2091 ▪ 45BN2150 ▪ 45BN2163 ▪ 45BN2086 ▪ 45BN2088 ▪ 45BN2093	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Confined
Determined not eligible for the NRHP	Architectural Resources	▪ 667765 (Nine Canyon Road) ▪ 721665 (McNary–Badger Canyon No. 1 Transmission Line) ▪ 722996 (147407 E. Beck Road Residence)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Local
Unevaluated for the NRHP	Archaeological Resources: Historic-period archaeological sites	▪ 45BN2085 ▪ 45BN2087 ▪ 45BN2089 ▪ 45BN2086 ▪ 45BN2148 ▪ 45BN2149 ▪ 45BN2088 ▪ 45BN2151 ▪ 45BN2152 ▪ 45BN2153 (Historic component) ▪ 45BN2093	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	Medium	Constant	Unlikely	Confined

Table 4.9-3: Potential Impacts from Turbine Construction

Resource Sensitivity	Resource Type	Resource ID	Potential Impact(s) and Applicant Commitments	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
Determined eligible for the NRHP	Architectural Resources	▪ 721666 (McNary–Franklin No. 2 Transmission Line) ▪ 722995 (Grain elevator) ▪ 724937 (Nicoson Road Farmstead Barn Storage Building) ▪ 724938 (Nicoson Road Farmstead Cribbed Grain Elevator)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from turbine construction	Unlikely	Regional
Determined eligible for the NRHP	Architectural Resources	▪ 721666 (McNary–Franklin No. 2 Transmission Line) ▪ 722995 (Grain elevator) ▪ 724937 (Nicoson Road Farmstead Barn Storage Building) ▪ 724938 (Nicoson Road Farmstead Cribbed Grain Elevator)	Physical impacts	High	Constant	Unlikely	Regional
Unidentified historic and cultural resources	Archaeological Resources and Architectural Resources	N/A	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Implementation of IDP in event of resource discovery	High	Constant	Feasible	Local
Traditional Cultural Properties	Traditional Cultural Properties: ▪ Places of cultural, religious and historical significance ▪ Burial sites ▪ Ancestral burial grounds ▪ First Foods ▪ Viewsheds ▪ Cultural landscapes and trails	N/A	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference	High	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from construction of turbines and fencing and the acquisition of land	Unavoidable	Regional

DAHP = Washington Department of Archaeology and Historic Preservation; ID = identification; IDP = Inadvertent Discovery Plan; N/A = not applicable; NRHP = National Register of Historic Places

Solar Arrays

The solar arrays are proposed over three areas. The Project activities pertaining to each area are similar, though the resources impacted vary according to each proposed area, as detailed in **Table 4.9-4**.

Impacts on historic and cultural resources from the construction of the solar arrays and associated supporting infrastructure would occur within the Solar Siting Areas. Impacts may result in the destruction of or damage to historic and cultural resources through ground disturbance and physical alteration. Activities with such impacts include:

- Surface leveling and clearance
- Construction of access roads, turnaround areas, and laydown areas
- Construction of the solar tracking system, supporting subsurface cables and connections
- Installation of underground cables/grid connections

Impacts from noise, vibration, visual interferences, and restriction of access could have adverse effects on historic and cultural resources through a loss or diminishment of integrity. Activities with such impacts include:

- Construction of solar modules that creates visual interference
- Construction traffic that creates or exacerbates noise
- Construction traffic that creates or exacerbates dust
- Vegetation clearance
- Security fencing to enclose Solar Siting Area(s)

Twenty-seven historic and cultural resources have been identified within the proposed Solar Siting Areas, including 20 archaeological resources and seven architectural resources (Section 3.9) (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2021; Davis, Tuck, et al. 2021). In addition, discussions with the affected Tribes have identified TCPs within or near the Solar Siting Areas (Section 3.9). The Cultural Resource Avoidance Plan and the IDP for historic and cultural resources are discussed in Section 4.9.2. A summary of potential impacts on historic and cultural resources during solar array construction is presented in **Table 4.9-4**.

East Solar Area (Bofer Canyon)

Twelve historic and cultural resources have been identified in the construction area for the East Solar array, including nine historic-period archaeological sites and three architectural resources (**Table 4.9-4**).

Two historic-period archaeological isolates (**45BN2138** and **45BN2155**), two historic-period archaeological sites (**45BN2139** and **45BN2156**), and two architectural resources (**721665** and **722996**) have been determined not eligible for listing on the NRHP (WISAARD 2022d, 2023a). Avoidance of the four archaeological resources is not required by DAHP. DAHP stated that the Project would not physically impact any identified architectural resources and, therefore, DAHP has no concerns about architectural resources (Hanson 2021b). For all historic and cultural resources determined not eligible for the NRHP, the magnitude of impact would be negligible. The impact duration would be constant beyond the life of the Project. The likelihood of impacts on these resources is probable. The spatial extent of impacts would be confined for the historic-period archaeological resources and local for the architectural resources.

Five historic-period archaeological sites are unevaluated for listing in the NRHP (**45BN205**, **45BN2140**, **45BN2141**, **45BN2142**, and **45BN2154**). The magnitude of impact on these resources is medium due to the potential for adverse effects (direct and indirect), as well as the resource sensitivity. With the Cultural Resource Avoidance Plan, the likelihood of impacts from turbine construction is rated as unlikely. If impacts were to occur, the duration would be constant beyond the life of the Project and the spatial extent would be confined.

One architectural resource (**721666**) has been determined eligible for the NRHP. DAHP has stated that the Project would not physically impact any identified architectural resources and, as such, DAHP has no concerns about architectural resources (Hanson 2021b). DAHP requested notice should the Project scope of work include physical impacts to any of the identified architectural resources (Hanson 2021b). Based on DAHP's review, the magnitude of impacts for architectural resource **721666** would be negligible. Impacts from noise, dust, and use of large equipment and heavy machinery would have short term duration. Impacts from the construction of turbines would be constant beyond the life of the Project due to the effect of the turbines on the viewshed of the architectural resource. For all impacts, the likelihood would be unlikely, and the spatial extent would be regional.

If any physical alterations to architectural resource **721666** did occur, the magnitude of impact would be high, and the duration would be constant beyond the life of the Project. With the Project's scope of work, impacts would be unlikely. The spatial extent/setting of such impacts would be regional (see **Table 4.9-4**).

West Solar Area 1 (County Well Road)

Ten historic and cultural resources have been identified in the West Solar Area 1 location, including six archaeological resources and four architectural resources (**Table 4.9-4**).

Precontact isolate **45BN2146** is not protected by RCW 27.53.060. However, the Yakama Nation has requested avoidance of this resource. In addition, DAHP has recommended avoidance of precontact archaeological isolates (Hanson 2021b). The magnitude of impacts to **45BN2146** would be high. The duration of impact would be constant beyond the life of the Project. The likelihood of impacts on this precontact archaeological resource is unlikely, given the Cultural Resource Avoidance Plan. The spatial extent would be confined.

One historic-period archaeological isolate (**45BN2144**), two historic-period archaeological sites (**45BN2157** and **45BN2158**), and four architectural resources (**724939**, **724940**, **724941**, and **724942**) associated with the 17302 County Well Road farmstead cluster have been determined not eligible for the NRHP (**Table 4.9-4**). Avoidance of the three archaeological resources is not required by DAHP. DAHP stated that the Project would not physically impact any identified architectural resources and, as such, DAHP has no concerns about architectural resources (Hanson 2021b). For all historic and cultural resources determined not eligible for the NRHP, the magnitude of impact would be negligible. The impact duration would be constant beyond the life of the Project. The likelihood of impacts on these resources is probable. The spatial extent of impacts would be confined for the historic-period archaeological resources and local for the architectural resources.

Two historic-period archaeological sites (**45BN2143** and **45BN2145**) are unevaluated for the NRHP. The magnitude of impact on these resources is medium due to the potential for adverse effects (direct and indirect) as well as the resource sensitivity. With the Cultural Resource Avoidance Plan, the likelihood of impacts from turbine construction is considered unlikely. If impacts were to occur, the duration would be constant beyond the life of the Project and the spatial extent would be confined.

West Solar Area 2 (Sellards Road)

Five historic-period archaeological sites (**45BN2147**, **45BN2159**, **45BN2160**, **45BN2161**, and **45BN2162**) have been identified in West Solar Area 2 (Sellards Road) (**Table 4.9-4**). All five are unevaluated for the NRHP. The magnitude of impact on these resources is medium due to the potential for adverse effects (direct and indirect), as well as the resource sensitivity. With the Cultural Resource Avoidance Plan, the likelihood of impacts from turbine construction is considered unlikely. If impacts were to occur, the duration would be constant beyond the life of the Project and the spatial extent would be confined.

All Solar Siting Areas

Resource sensitivity for unidentified historic and cultural resources across all Solar Siting Areas is of highest concern. The IDP would be implemented in the event that previously unidentified resources were discovered during construction. For unidentified historic and cultural resources across all solar siting construction areas, impacts would be high in magnitude, in compliance with the worst-case analysis stipulated by WAC 197-11-080. Impacts would be constant in duration, and feasible in terms of their likelihood. Spatial extent is assumed to be local because unidentified historic and cultural resources adjacent to the proposed Lease Boundary could be impacted.

The presence of TCPs within the Lease Boundary has been confirmed through coordination with the Tribes. Information on the presence and location of TCPs across all Solar Siting Areas, specifically, is limited and confidential. In compliance with the worst-case analysis stipulated by WAC 197-11-080, the magnitude of impact on TCPs across all solar siting construction areas would be high. Impact duration would be short term for noise, dust, and use of large equipment and heavy machinery. Impact duration would be constant for the construction of turbines and fencing and the acquisition of land due to effects on viewsheds and access. The likelihood of impacts is unavoidable, given that TCPs are known to exist within the Lease Boundary. The spatial extent of impacts on TCPs would be regional.

Table 4.9-4: Potential Impacts from Solar Array Construction

Resource Sensitivity	Resource Type	Resource ID	Potential Impact(s) and Applicant Commitments	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
East Solar (Bofer Canyon)							
Determined not eligible for the NRHP	Archaeological Resources: Historic-period archaeological sites or isolates	▪ 45BN2138 ▪ 45BN2155 ▪ 45BN2139 ▪ 45BN2156	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Confined
Determined not eligible for the NRHP	Architectural Resources	▪ 721665 (McNary–Badger Canyon No. 1 Transmission Line) ▪ 722996 (147407 E. Beck Road Residence)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Unlikely	Local
Unevaluated for the NRHP	Archaeological Resources: Historic-period archaeological sites	▪ 45BN205 ▪ 45BN2140 ▪ 45BN2141 ▪ 45BN2142 ▪ 45BN2154	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	Medium	Constant	Unlikely	Confined
Determined eligible for the NRHP	Architectural Resource	▪ 721666 (McNary–Franklin No. 2 Transmission Line)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from turbine construction	Unlikely	Regional
Determined eligible for the NRHP	Architectural Resource	▪ 721666 (McNary–Franklin No. 2 Transmission Line)	Physical impacts	High	Constant	Unlikely	Regional
West Solar 1 (County Well Road)							
Avoidance requested and recommended	Archaeological Resources: Precontact isolate	▪ 45BN2146	Destruction of or damage to resource through ground disturbance and physical alteration; adverse effects on resource through a loss or diminishment of integrity Resource to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	Unlikely	Confined
Unevaluated for the NRHP	Archaeological Resources: Historic-period archaeological sites	▪ 45BN2143 ▪ 45BN2145	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	Medium	Constant	Unlikely	Confined

Table 4.9-4: Potential Impacts from Solar Array Construction

Resource Sensitivity	Resource Type	Resource ID	Potential Impact(s) and Applicant Commitments	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
Determined not eligible for the NRHP	Archaeological Resources: Historic-period archaeological sites or isolates	▪ 45BN2144 ▪ 45BN2157 ▪ 45BN2158	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Confined
Determined not eligible for the NRHP	Architectural Resources	▪ 724939 (Farmhouse and Garage) ▪ 724940 (Shop) ▪ 724941 (Machine Shed) ▪ 724942 (Grain Elevator and Grain Storage Silos)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from turbine construction	Unlikely	Local
West Solar 2 (Sellards Road)							
Unevaluated for the NRHP	Archaeological Resources: Historic-period archaeological sites	▪ 45BN2147 ▪ 45BN2159 ▪ 45BN2160 ▪ 45BN2161 ▪ 45BN2162	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	Medium	Constant	Unlikely	Confined
All Solar Siting Areas							
Unidentified historic and cultural resources	Archaeological Resources and Architectural Resources	▪ N/A	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Implementation of IDP in event of resource discovery	High	Constant	Feasible	Local
Traditional Cultural Properties	Traditional Cultural Properties: ▪ Places of cultural, religious and historical significance ▪ Burial sites ▪ Ancestral burial grounds ▪ First Foods ▪ Viewsheds Cultural landscapes and trails	▪ N/A	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference	High	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from construction of turbines and fencing and the acquisition of land	Unavoidable	Regional

DAHP = Washington Department of Archaeology and Historic Preservation; ID = identification; IDP = Inadvertent Discovery Plan; N/A = not applicable; NRHP = National Register of Historic Places

Substations and Battery Energy Storage System(s)

Four primary and two alternate substation locations have been proposed. Construction for each substation and associated supporting infrastructure would be confined to a 4-acre area. In addition, a BESS may be constructed adjacent to two of the proposed substations (Horse Heaven Wind Farm, LLC 2022). Impacts on historic and cultural resources may result in the destruction of or damage to historic and cultural resources through ground disturbance and physical alteration. Activities with such impacts include:

- Surface clearance and grading
- Installation of underground cables/grid connections
- Security fencing to enclose substations and BESS

Impacts from substation construction activities associated with noise, vibration, visual interferences, and restriction of access could have adverse effects on historic and cultural resources through a loss or diminishment of integrity. Activities with such impacts include:

- Construction traffic that creates or exacerbates noise
- Construction traffic that creates or exacerbates dust
- Vegetation clearance
- Fencing
- Land acquisition
- Use of large equipment and heavy machinery

Three historic-period archaeological sites and two architectural resources have been identified within the proposed substation construction areas, including alternate locations and adjacent BESS location(s) (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2021; Davis, Tuck, et al. 2021) (Section 3.9). A summary of potential impacts on historic and cultural resources during substation and BESS construction is presented in **Table 4.9-5**.

Three historic-period archaeological sites (**45BN2157**, **45BN2158**, and **45BN2093**) and one architectural resource (**721665**) have been determined not eligible for the NRHP (WISAARD 2022a). Avoidance of the three archaeological resources is not required by DAHP. DAHP stated that the Project would not physically impact any identified architectural resources and, therefore, DAHP has no concerns about architectural resources (Hanson 2021b). For all historic and cultural resources determined not eligible for the NRHP, the magnitude of impact would be negligible. The impact duration would be constant beyond the life of the Project. The likelihood of impacts on these resources is probable. The spatial extent of impacts would be confined for the historic-period archaeological resources and local for the architectural resources.

Architectural resource **721666** (McNary–Franklin No. 2 Transmission Line) has been determined eligible for the NRHP. DAHP has stated that the Project would not physically impact any identified architectural resources and, therefore, DAHP has no concerns about architectural resources (Hanson 2021b). DAHP requested notice should the Project scope of work include physical impacts on any of the identified architectural resources (Hanson 2021b). Based on DAHP's review, the magnitude of impacts for architectural resource **721666** would be negligible. Impacts from noise, dust, and use of large equipment and heavy machinery would have a short-term duration. Impacts from the construction of turbines would be constant beyond the life of the Project due to the effect of the turbines on the viewshed of the architectural resource. For all impacts, the likelihood would be unlikely, and the spatial extent would be regional.

If any physical alterations did occur to architectural resource **721666**, the magnitude of impact would be high, and the duration would be constant beyond the life of the Project. With the Project’s scope of work, impacts would be unlikely. The spatial extent/setting of such impacts would be regional (see **Table 4.9-5**).

Resource sensitivity for unidentified historic and cultural resources within the substation and BESS construction areas is of highest concern. The IDP would be implemented in the event that previously unidentified resources were discovered during construction. For unidentified historic and cultural resources within construction areas, impacts would be high in magnitude, in compliance with the worst-case analysis stipulated by WAC 197-11-080. Impacts would be constant in duration, and feasible in terms of their likelihood. Spatial extent is assumed to be local because unidentified historic and cultural resources adjacent to the proposed Lease Boundary could be impacted.

The presence of TCPs within the Lease Boundary has been confirmed through coordination with the Tribes. Information on the presence and location of TCPs within the substation and BESS construction areas, specifically, is limited and confidential. In compliance with the worst-case analysis stipulated by WAC 197-11-080, the magnitude of impact on TCPs within the substation and BESS construction areas would be high. Impact duration would be short term for noise, dust, and use of large equipment and heavy machinery. Impact duration would be constant for the construction of turbines and fencing and the acquisition of land due to effects on viewsheds and access. The likelihood of impacts is unavoidable, given that TCPs are known to exist within the Lease Boundary. The spatial extent of impacts on TCPs would be regional.

Table 4.9-5: Potential Impacts from Substation and BESS Construction

Resource Sensitivity	Resource Type	Resource ID	Potential Impact(s) and Applicant Commitments	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
Determined not eligible for the NRHP	Archaeological Resources: Historic-period archaeological sites	▪ 45BN2157 ▪ 45BN2158 ▪ 45BN2093	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Confined
Determined not eligible for the NRHP	Architectural Resources	▪ 721665 (McNary–Badger Canyon No. 1 Transmission Line)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	unlikely	Local
Determined eligible for the NRHP	Architectural Resource	▪ 721666 (McNary–Franklin No. 2 Transmission Line)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from turbine construction	Unlikely	Regional
Determined eligible for the NRHP	Architectural Resource	▪ 721666 (McNary–Franklin No. 2 Transmission Line)	Physical impacts	High	Constant	Unlikely	Regional
Unidentified historic and cultural resources	Archaeological Resources and Architectural Resources	N/A	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Implementation of IDP in event of resource discovery	High	Constant	Feasible	Local
Traditional Cultural Properties	Traditional Cultural Properties: ▪ Places of cultural, religious and historical significance ▪ Burial sites ▪ Ancestral burial grounds ▪ First Foods ▪ Viewsheds ▪ Cultural landscapes and trails	N/A	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference	High	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from construction of turbines and fencing and the acquisition of land	Unavoidable	Regional

DAHP = Washington Department of Archaeology and Historic Preservation; ID = identification; IDP = Inadvertent Discovery Plan; N/A = not applicable; NRHP = National Register of Historic Places

Comprehensive Project

The preceding discussion describes the potential impacts on historic and cultural resources from construction of individual Project subcomponents. A summary of potential impacts on historic and cultural resources during construction of the comprehensive Project is presented in **Table 4.9-6**.

The construction of the entire Project could result in the following potential impacts:

- Destruction of or damage through ground disturbance and physical alteration
- Adverse effects through a loss or diminishment of integrity
- Loss of access
- Visual interference

The successful implementation of the Cultural Resource Avoidance Plan and/or IDP would ensure the avoidance of impacts on:

- Historic-period archaeological sites that are either unevaluated or eligible for the NRHP
- Precontact archaeological resources (sites and isolates)
- Unidentified historic and cultural resources

Impacts from the comprehensive project to precontact archaeological resources, historic-period archaeological resources (either not eligible or unevaluated for the NRHP), and architectural resources (either not eligible or eligible for the NRHP) would be the same as discussed in the preceding sections. Given the finite number and discrete locations of archaeological and architectural resources, the impacts from the comprehensive project are expected to be equivalent to the summation of the impacts of the various components.

For unidentified historic and cultural resources within construction areas, impacts would be high in magnitude, in compliance with the worst-case analysis stipulated by WAC 197-11-080. Impacts would be constant in duration, and feasible in terms of their likelihood. Spatial extent is assumed to be local because unidentified historic and cultural resources adjacent to the proposed Lease Boundary could be impacted.

The presence of TCPs within the Lease Boundary has been confirmed through coordination with the Tribes. Information on the presence and location of TCPs with respect to the comprehensive Project is limited and confidential. In compliance with the worst-case analysis stipulated by WAC 197-11-080, the magnitude of impact on TCPs within the substation and BESS construction areas would be high. Impact duration would be short term for noise, dust, and use of large equipment and heavy machinery. Impact duration would be constant for the construction of turbines and fencing and the acquisition of land due to effects on viewsheds and access. The likelihood of impacts is unavoidable, given that TCPs are known to exist within the Lease Boundary. The spatial extent of impacts on TCPs would be regional.

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Table 4.9-6: Potential Impacts from Comprehensive Project – Construction

Resource Sensitivity	Resource Type	Impact	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
DAHP-issued permit required prior to disturbance	Archaeological Resources: Precontact or multicomponent sites	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	Unlikely	Confined
Avoidance requested and recommended	Archaeological Resources: Precontact isolates	Destruction of or damage to resource through ground disturbance and physical alteration; adverse effects on resource through a loss or diminishment of integrity Resource to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	Unlikely	Confined
Traditional Cultural Properties	Traditional Cultural Properties: ▪ Places of cultural, religious and historical significance ▪ Burial sites ▪ Ancestral burial grounds ▪ First Foods ▪ Viewsheds ▪ Cultural landscapes and trails	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference	High	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from construction of turbines and fencing and the acquisition of land	unavoidable	Regional
Unevaluated for the NRHP	Archaeological Resources: Historic-period archaeological sites	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	Medium	Constant	probable	Confined
Unidentified historic and cultural resources	Archaeological Resources and Architectural Resources	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Implementation of IDP in event of resource discovery	High	Constant	Feasible	Local
Determined eligible for the NRHP	Architectural Resources	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from turbine construction	Unlikely	Regional
Determined eligible for the NRHP	Architectural Resources	Physical impacts	High	Constant	Unlikely	Regional
Determined not eligible for the NRHP	Archaeological Resources	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Confined
Determined not eligible for the NRHP	Architectural Resources	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Unlikely	Local

DAHP = Washington Department of Archaeology and Historic Preservation; ID = identification; IDP = Inadvertent Discovery Plan; N/A = not applicable; NRHP = National Register of Historic Places

4.9.2.2 Impacts during Operation

Impacts on historic and cultural resources are anticipated during operation of the Project. Impacts from all subcomponents are anticipated to be identical during operation. Therefore, this EIS analyzes impacts from the operation of the comprehensive Project only.

The magnitude of impacts from the operation of the comprehensive Project could range from negligible to high, based on the resource sensitivity and the extent of adverse effects, both direct and indirect, on historic and cultural resources (see Section 4.9.1 Method of Analysis). For impacts during operation, resource sensitivity is of highest concern for TCPs, NRHP-eligible architectural resources, and unidentified historic and cultural resources. A summary of potential impacts on historic and cultural resources during Project operation is presented in **Table 4.9-7**.

Comprehensive Project

Impacts from Project operation associated with noise, vibration, visual interferences, and restriction of access could have adverse effects on historic and cultural resources through a loss or diminishment of integrity. Activities with such impacts include:

- Operation of multiple turbines, solar arrays, substations, and BESS
- Creation or exacerbation of noise from maintenance vehicles
- Creation or exacerbation of dust from maintenance vehicles
- Use of security measures to restrict access to Project subcomponents

During Project operation, fencing to restrict access to turbines, solar arrays, and substation and BESS locations could result in loss of access for Tribes to TCPs that may be present within these spaces. Fencing could result in fragmentation of the wider cultural landscape. Impacts on the environmental setting and wider cultural landscape through visual changes during the operational stage of wind and solar projects are subjective and are discussed in more detail in Section 4.10. In the case of the Project, visual interference from multiple operating turbines could have a high-magnitude impact on the sense of place of cultural landscapes both within and beyond the Lease Boundary, affecting distant viewsheds (toward and across the Lease Boundary), linkages between TCPs, and the immediate confines of a specific TCP site and its unique sociocultural setting.

The presence of TCPs within the Lease Boundary has been confirmed through coordination with the Tribes. Information on the presence and location of TCPs with respect to the comprehensive Project limited and confidential. In compliance with the worst-case analysis stipulated by WAC 197-11-080, the magnitude of impact on TCPs during Project operation would be high. Impact duration would be long term for noise and dust. Impact duration would be constant for the operation of the turbines and security measures due to visual interference, restricted access, and destruction of the landforms and resources that are sacred. The likelihood of impacts is probable, given that TCPs are known to exist within the Lease Boundary. The spatial extent of impacts on TCPs would be regional.

Four architectural resources (**721666**, **722995**, **724937**, **724938**) within the Lease Boundary have been determined eligible for the NRHP (WISAARD 2022b, 2022c, 2023b, 2023c). DAHP has stated that the Project would not physically impact any identified architectural resources and, therefore, DAHP has no concerns about architectural resources (Hanson 2021b). Based on DAHP's review, the magnitude of impacts for the architectural resources would be negligible. Impacts from noise and dust would have long-term duration. Impacts from the operation of the turbines would be constant during the life of the Project due to the effect of the turbines on the viewshed of the architectural resources. For all impacts, the likelihood would be unlikely, and the spatial extent would be regional.

For unidentified historic and cultural resources within the Lease Boundary, impacts during Project operation would be low in magnitude. Impacts would be long term in duration, and feasible in terms of their likelihood. Spatial extent is assumed to be local because unidentified historic and cultural resources adjacent to the proposed Lease Boundary could be impacted.

Table 4.9-7: Potential Impacts from Comprehensive Project – Operation

Resource Sensitivity	Resource Type	Resource ID	Impact	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
Traditional Cultural Properties	Traditional Cultural Properties: ▪ Places of cultural, religious and historical significance ▪ Burial sites ▪ Ancestral burial grounds ▪ First Foods ▪ Viewsheds ▪ Cultural landscapes and trails	N/A	Noise, vibration, visual interferences, and restriction of access	High	Long term for impacts from noise and dust Constant for impacts from turbine operation and security measures	Unavoidable	Regional
Determined eligible for the NRHP	Architectural Resources	▪ 721666 (McNary–Franklin No. 2 Transmission Line) ▪ 722995 (Grain elevator) ▪ 724937 (Nicoson Road Farmstead Barn Storage Building) ▪ 724938 (Nicoson Road Farmstead Cribbed Grain Elevator)	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Long term for impacts from noise and dust Constant for impacts from the turbine operation	Unlikely	Regional
Unidentified historic and cultural resources	▪ Archaeological Resources and Architectural Resources	N/A	Adverse effects on resources through a loss or diminishment of integrity Implementation of IDP in event of resource discovery	Low	Long Term	Feasible	Local

DAHP = Washington Department of Archaeology and Historic Preservation; ID = identification; IDP = Inadvertent Discovery Plan; N/A = not applicable; NRHP = National Register of Historic Places

4.9.2.3 Impacts during Decommissioning

Comprehensive Project

Decommissioning activities are assumed to involve the removal of most of the Project's aboveground structures to allow site redevelopment or restoration. This EIS analyzes impacts from decommissioning of the comprehensive Project only. For Project decommissioning, resource sensitivity is of highest concern for precontact archaeological resources (sites and isolates), TCPs, and unidentified historic and cultural resources. A summary of potential impacts on historic and cultural resources during Project decommissioning is presented in **Table 4.9-8**.

No additional ground disturbance would occur beyond that carried out for construction. However, impacts from decommissioning may result in the destruction of or damage to historic and cultural resources through ground disturbance and physical alteration. Activities with such impacts include:

- Surface grading
- Surface clearance
- Removal of tower foundations
- Removal of supporting infrastructure (e.g., meteorological stations, transformers, and underground cables)
- Removal of fencing

Impacts from decommissioning activities associated with noise, vibration, visual interferences, and restriction of access could have adverse effects on historic and cultural resources through a loss or diminishment of integrity. Activities with such impacts include:

- Heavy vehicle traffic that creates or exacerbates noise
- Heavy vehicle traffic that creates or exacerbates dust
- Temporary access restrictions
- Use of large equipment and heavy machinery

For all archaeological resources within the Lease Boundary, impacts may result in destruction of or damage through ground disturbance and physical alteration and/or adverse effects. For precontact archaeological resources (sites and isolates), such impacts would be high in magnitude. Impacts would have medium and negligible magnitude for unevaluated and noneligible historic-period archaeological resources, respectively. Impacts would be unlikely for all archaeological resources, given that ground disturbance would be limited to areas previously impacted by Project construction. The Cultural Resource Avoidance Plan would also make impacts unlikely. Duration would be constant beyond the life of the Project, and spatial extent would be confined.

The presence of TCPs within the Lease Boundary has been confirmed through coordination with the Tribes. Information on the presence and location of TCPs with respect to the comprehensive Project is limited and confidential. In compliance with the worst-case analysis stipulated by WAC 197-11-080, the magnitude of impact on TCPs from Project decommissioning would be high. Impact duration would be short term for noise, dust, temporary access restrictions, and use of large equipment and heavy machinery. The likelihood of impacts is unavoidable, given that TCPs are known to exist within the Lease Boundary. The spatial extent of impacts on TCPs would be regional.

For unidentified historic and cultural resources, impacts from decommissioning would be high in magnitude, in compliance with the worst-case analysis stipulated by WAC 197-11-080. Impacts would be constant in duration and confined in spatial extent. Impacts would be unlikely, given that ground disturbance would be limited to areas previously impacted by Project construction. The Cultural Resource Avoidance Plan would also make impacts unlikely.

DAHP has stated that the Project would not physically impact any identified architectural resources and, as such, DAHP has no concerns about architectural resources (Hanson 2021b). DAHP requested notice should the Project scope of work include physical impacts to any of the identified architectural resources (Hanson 2021b). Based on DAHP's review, the magnitude of impacts for architectural resources from Project decommissioning would be Negligible. Impacts from noise, dust, and use of large equipment and heavy machinery would have short-term duration. The likelihood would be Unlikely, and the spatial extent would be regional for NRHP-eligible resources and local for non-eligible resources.

If any physical alterations did occur to any architectural resources, the magnitude of impact would be high for NRHP-eligible resources and low for noneligible resources, and the duration would be constant beyond the life of the Project. With the Project's scope of work, impacts would be unlikely. The spatial extent/setting of such impacts would be regional for NRHP-eligible resources and local for not eligible resources (see **Table 4.9-8**)

Table 4.9-8: Potential Impacts from Comprehensive Project – Decommissioning

Resource Sensitivity	Resource Type	Impact	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional
DAHP-issued permit required prior to disturbance	Archaeological Resources: Precontact or multicomponent sites	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	Unlikely	Confined
Avoidance requested and recommended	Archaeological Resources: Precontact isolates	Destruction of or damage to resource through ground disturbance and physical alteration; adverse effects on resource through a loss or diminishment of integrity Resource to be avoided through application of the Cultural Resource Avoidance Plan	High	Constant	Unlikely	Confined
Unevaluated for the NRHP	Archaeological Resources: Historic-period archaeological sites	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Resources to be avoided through application of the Cultural Resource Avoidance Plan	Medium	Constant	Unlikely	Confined
Determined not eligible for the NRHP	Archaeological Resources	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Unlikely	Confined
Traditional Cultural Properties	Traditional Cultural Properties: ▪ Places of cultural, religious and historical significance ▪ Burial sites ▪ Ancestral burial grounds ▪ First Foods ▪ Viewsheds ▪ Cultural landscapes and trails	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference	High	Short term	Unavoidable	Regional
Unidentified historic and cultural resources	Archaeological Resources and Architectural Resources	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity Implementation of IDP in event of resource discovery	High	Constant	Unlikely	Confined
Determined eligible for the NRHP	Architectural Resources	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short term	Unlikely	Regional
Determined not eligible for the NRHP	Architectural Resources	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Short-term	Unlikely	Local
Determined not eligible for the NRHP	Architectural Resources	Physical impacts	Low	Constant	Unlikely	Local

DAHP = Washington Department of Archaeology and Historic Preservation; ID = identification; IDP = Inadvertent Discovery Plan; N/A = not applicable; NRHP = National Register of Historic Places

4.9.2.4 Recommended Mitigation Measures

This section describes proposed mitigation measures to minimize or avoid impacts on historic and cultural resources from construction, operation, and decommissioning of the Project. Mitigation identified by EFSEC consists of Traditional Cultural Properties Mitigation (CR-1) and Archaeological and Architectural Resources Mitigation (CR-2). Guidance and input from DAHP and the Tribes have been and will continue to be sought for all proposed mitigation measures. Further mitigation for impacted resources may be developed through coordination with EFSEC, DAHP, and Tribes.

Mitigation is not considered fully effective when part of the measure requires cooperation by a third party (e.g., DAHP, Tribes), which EFSEC cannot require. EFSEC would work with the identified parties to facilitate cooperation in implementing a mitigation measure. Additional analysis required for historic and cultural resources is explained further in ES-4 Key Issues and Issues to Be Resolved.

In October 2023, CTUIR notified EFSEC that. through coordination with Horse Heaven Wind Farm, LLC, CTUIR's concerns regarding historic and cultural resources had been addressed. CTUIR and Horse Heaven Wind Farm, LLC have been in discussions regarding the Horse Heaven Clean Energy Center and have reached a mutual agreement to mitigate adverse effects on cultural resources and historic property of religious and cultural significance to the CTUIR (Ashley 2023).

The Yakama Nation have requested further consultation regarding appropriate site buffers on a site-by-site basis throughout the Project. Particular historic and cultural resources may require a larger buffer than those stated in the Applicant Commitments.

CR-1:[48] Traditional Cultural Properties Mitigation

Ongoing engagement with affected Tribes could facilitate mitigation of any potential impacts on TCPs. Tribal review of site/engineering plans could provide input to guide design and avoidance, without confidential disclosure of locations. This engagement should also include opportunities for identified stakeholders to evaluate the effectiveness of any implemented mitigation measures throughout the Project's lifecycle.

Appropriate mitigation measures may include (but are not limited to) the demarcation of "no-go," culturally sensitive areas to be avoided by contractors throughout the life of the Project, including redesign, refinement, and/or maintenance. The demarcation of culturally sensitive areas could also facilitate safe access to TCPs and/or other places of cultural significance for Tribes. If appropriate, the implementation of environmental enhancement measures (e.g., planting and/or screening) or the protection of certain aspects of the environmental setting may be considered in coordination with affected Tribes.

The CTUIR proposed several mitigation strategies (CTUIR 2021a, 2021b). Potential mitigation strategies include:

- Enable continued access for Tribes through an Access Agreement (e.g., continued access to First Foods).
- Create protections for natural resources that support First Foods procurement (e.g., preserve landforms, practice responsible stream management, avoid negative impacts on pollinator species).

[48] CR-: Identifier of numbered mitigation item for Historic and Cultural Resources

- Perform off-site mitigation, including education and outreach work, to assist Tribes in the perpetuation of oral history and legends that would have been taught in-situ in the Area of Analysis; engage with Tribes on appropriate rehabilitation (closure) strategies for the safeguarding of viewshed and cultural landscapes.
- Include Tribal representatives during any ground-disturbing activities (Cultural Resource Monitor).
- Develop an agreement with the Tribes in anticipation of a time when the wind farm would be considered for disassembly to restore the landscape and viewshed.

CR-2: Archaeological and Architectural Resources Mitigation

Table 4.9-9 sets out proposed mitigation measures for historic and cultural resources potentially impacted by the Project. Any mitigation strategies should be detailed in an agreement document between EFSEC, DAHP, the Tribes, and the Project proponent.

Mitigation measures are intended to minimize impacts on historic and cultural resources with elevated sensitivity (precontact archaeological resources, NRHP-eligible historic-period archaeological resources, TCPs, and unidentified historic and cultural resources), primarily through avoidance. If avoidance is not possible, the mitigation clarifies which resources would require a DAHP permit prior to disturbance. Mitigation measures also identify instances where engagement with DAHP, Tribes, and/or landowners would be required.

Table 4.9-9: Summary of Recommendations for Historic and Cultural Resources Potentially Impacted by the Project

Resource ID	Resource Type	Resource Sensitivity	Required Mitigation If Avoidance Not Possible
▪ 45BN2092 ▪ 45BN2146	Archaeological Resources Precontact Isolates	Avoidance requested and recommended	▪ DAHP permit not required for disturbance ▪ Further coordination with Tribes and DAHP
▪ 45BN261 ▪ 45BN2090 ▪ 45BN2153 (precontact component)	Archaeological Resources: Precontact or multicomponent sites	Avoidance requested and recommended DAHP-issued permit required prior to disturbance	▪ Further coordination with Tribes and DAHP

Table 4.9-9: Summary of Recommendations for Historic and Cultural Resources Potentially Impacted by the Project

Resource ID	Resource Type	Resource Sensitivity	Required Mitigation If Avoidance Not Possible
▪ 45BN2081 ▪ 45BN2082 ▪ 45BN2083 ▪ 45BN2084 ▪ 45BN2086 ▪ 45BN2088 ▪ 45BN2091 ▪ 45BN2093 ▪ 45BN2138 ▪ 45BN2139 ▪ 45BN2144 ▪ 45BN2150 ▪ 45BN2155 ▪ 45BN2156 ▪ 45BN2157 ▪ 45BN2158 ▪ 45BN2163	Archaeological Resources: Historic-Period Sites and Isolates	Determined not eligible for the NRHP	▪ None
▪ 45BN205 ▪ 45BN2085 ▪ 45BN2087 ▪ 45BN2089 ▪ 45BN2140 ▪ 45BN2141 ▪ 45BN2142 ▪ 45BN2143 ▪ 45BN2145 ▪ 45BN2147 ▪ 45BN2148 ▪ 45BN2149 ▪ 45BN2151 ▪ 45BN2152 ▪ 45BN2153 (historic component) ▪ 45BN2154 ▪ 45BN2159 ▪ 45BN2160 ▪ 45BN2161 ▪ 45BN2162	Archaeological Resources (Historic Sites)	Unevaluated for the NRHP	▪ DAHP permit required prior to any disturbance ▪ Evaluate site for NRHP eligibility

Table 4.9-9: Summary of Recommendations for Historic and Cultural Resources Potentially Impacted by the Project

Resource ID	Resource Type	Resource Sensitivity	Required Mitigation If Avoidance Not Possible
▪ 667765 (Nine Canyon Road) ▪ 721665 (McNary–Badger Canyon No. 1 Transmission Line) ▪ 722996 (147407 E. Beck Road Residence) ▪ 724939 (Farmhouse and Garage) ▪ 724940 (Shop) ▪ 724941 (Machine Shed) ▪ 724942 (Grain Elevator and Grain Storage Silos)	Architectural Resources	Determined not eligible for the NRHP	▪ Notify DAHP of any anticipated physical impacts
▪ 721666 (McNary–Franklin No. 2 Transmission Line) ▪ 722995 (Grain elevator) ▪ 724937 (Nicoson Road Farmstead Barn Storage Building) ▪ 724938 (Nicoson Road Farmstead Cribbed Grain Elevator)	Architectural Resources	Determined eligible for the NRHP	▪ Notify DAHP of any anticipated physical impacts
N/A	Archaeological Resources and Architectural Resources	Unidentified historic and cultural resources	▪ DAHP permit required prior to any disturbance to archaeological sites ▪ Further coordination with Tribes and DAHP

Notes:
DAHP = Washington State Department of Archaeology and Historic Preservation; ID = identification; N/A = not applicable; NRHP = National Register of Historic Places

4.9.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would occur.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and consider undergrounding transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[49]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary

[49] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remain. The additional Applicant commitments identified above do not change the impact ratings previously provided for historic and cultural resources in the Draft EIS, and the impact ratings remain the same.

4.9.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn depend on the magnitude and duration of an impact. “Significant” in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting impact would be severe if it occurred (WAC 197-11-794).

This EIS weighs the impacts on historic and cultural resources that may result from the proposed Project with mitigation and makes a resulting determination of significance for each impact in **Tables 4.9-11a, 4.9-11b,** and **4.9-11c**. As shown in the impact summary tables below, EFSEC has determined that significant impacts for partial or complete loss to TCPs could occur during all phases of the Project.

Table 4.9-10a: Summary of Potential Impacts on Historic and Cultural Resources during Construction of the Proposed Action

Resource Type(s) and Sensitivity	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[©]	Significant Unavoidable Adverse Impacts[(d)]
Precontact Archaeological resources; DAHP-issued permit required prior to disturbance - OR - Avoidance requested and recommended	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	High	Constant	Unlikely	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of a Cultural Resource Avoidance Plan	None identified
Historic-period archaeological isolates and sites determined not eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Architectural resources determined not eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Probable	Local	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Unevaluated archaeological historic-period sites	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Medium	Constant	Unlikely	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of a Cultural Resource Avoidance Plan	None identified
Architectural Resources determined eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Adverse effects on resources through a loss or diminishment of integrity	Low	Short term for impacts from noise, dust, and use of large equipment and heavy machinery Constant for impacts from turbine construction	Feasible	Regional	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified

Table 4.9-10a: Summary of Potential Impacts on Historic and Cultural Resources during Construction of the Proposed Action

Resource Type(s) and Sensitivity	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[©]	Significant Unavoidable Adverse Impacts[(d)]
Architectural Resources determined eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Physical impacts	High	Constant	Unlikely	Regional	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Unidentified historic and cultural resources	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity.	High	Constant	Feasible	Local	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of an Inadvertent Discovery Plan	None identified
Traditional Cultural Properties	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference.	High	Short term for impacts from noise, dust, and use of large equipment and heavy machinery. Constant for impacts from construction of turbines and fencing and the acquisition of land.	Unavoidable	Regional	**CR-1:** Traditional Cultural Properties Mitigation	Significant for partial or complete loss of traditional cultural properties.

Notes:

(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.

(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impact©[(c)] Mitigation measures listed here are additional actions that EFSEC could impose on the Applicant to further reduce the impacts. See Section 4.1, Introduction for details.

(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.

Applicant = Horse Heaven Wind Farm, LLC; BESS= battery energy storage system; DAHP = Washington Department of Archaeology and Preservation; EFSEC = Washington Energy Facility Site Evaluation Council; NRHP = National Register of Historic Places; Tribes = Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Wanapum Tribe

Table 4.9-10b: Summary of Potential Impacts on Historic and Cultural Resources during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Architectural Resources determined eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Adverse effects on resources through a loss or diminishment of integrity.	Low	Long term for impacts from noise and dust Constant for impacts from the turbine operation	Feasible	Regional	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Unidentified historic and cultural resources	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Adverse effects on resources through a loss or diminishment of integrity	Low	Long Term	Probable	Local	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of an Inadvertent Discovery Plan	None identified
Traditional Cultural Properties	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Noise, vibration, visual interferences, and restriction of access.	High	Long term for impacts from noise and dust Constant for impacts from turbine operation and security measures	Unavoidable	Regional	**CR-1:** Traditional Cultural Properties Mitigation	Significant for partial or complete loss of traditional cultural properties and resources.

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose on the Applicant to further reduce the impacts. See Section 4.1, Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
Applicant = Horse Heaven Wind Farm, LLC; BESS= battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.9-10c: Summary of Potential Impacts on Historic and Cultural Resources during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Precontact Archaeological resources; DAHP-issued permit required prior to disturbance - OR - Avoidance requested and recommended	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	High	Constant	Unlikely	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of a Cultural Resource Avoidance Plan	None identified
Historic-period archaeological isolates and sites determined not eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Negligible	Constant	Unlikely	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Architectural resources determined not eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Adverse effects on resources through a loss or diminishment of integrity.	Low	Short-term	Feasible	Local	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Architectural resources determined not eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Physical impacts	Low	Constant	Unlikely	Local	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Unevaluated archaeological historic-period sites	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity	Medium	Constant	Unlikely	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of a Cultural Resource Avoidance Plan	None identified
Architectural Resources determined eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Adverse effects on resources through a loss or diminishment of integrity	Low	Short term	Feasible	Regional	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Architectural Resources determined eligible for the NRHP	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Physical impacts	High	Constant	Unlikely	Regional	**CR-2:** Archaeological and Architectural Resources Mitigation	None identified
Unidentified historic and cultural resources	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; adverse effects on resources through a loss or diminishment of integrity.	High	Constant	Probable	Confined	**CR-2:** Archaeological and Architectural Resources Mitigation to include the implementation of an Inadvertent Discovery Plan	None identified
Traditional Cultural Properties	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Destruction of or damage to resources through ground disturbance and physical alteration; loss of access to resources; visual interference.	High	Short term	Unavoidable	Regional	**CR-1:** Traditional Cultural Properties Mitigation	Significant for partial or complete loss of traditional cultural properties and resources

Notes:
(a) The impacts related to each component including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose on the Applicant to further reduce the impacts. See Section 4.1, Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
Applicant = Horse Heaven Wind Farm, LLC; BESS= battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council
NRHP = National Register of Historic Places; Tribes = Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Wanapum Tribe

4.9.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to historical and cultural resources from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.10 Visual Aspects, Light and Glare

This section evaluates the visual and aesthetic impacts of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) within the area of analysis for visual resources. Section 3.10 presents the affected environment for visual aspects, light and glare. The analysis area includes the key observation point (KOP) locations and residential receptors on adjacent properties and areas of dense population near the City of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River.

In accordance with the Washington State Environmental Policy Act, this Environmental Impact Statement (EIS) weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when determining the significance of identified potential impacts (WAC 197-11-330 and WAC 197-11-794). The impact rating is summarized in **Table 4.10-1.**

Table 4.10-1: Impact Rating Table for Visual Aspects, Light and Glare from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Background

Potential impacts from the Proposed Action are assessed for visual aspects, shadow flicker, light, and glare during the construction, operation, and decommissioning stages of the following Project components:

- Turbine Option 1 and Turbine Option 2
- Solar arrays
- Battery energy storage systems (BESS)

- Substations and transmission lines
- Comprehensive Project

The evaluation presented herein relies on the following reports generated for the Application for Site Certification (ASC) for the Project, or subsequently provided for this EIS:

- Updated Visual Impact Assessment Report (SWCA 2023)
- Aesthetics Technical Memorandum for the Horse Heaven Wind Farm Project provided by Horse Heaven Wind Farm, LLC (Horse Heaven Wind Farm, LLC 2021a)
- 2022 ASC provided by Horse Heaven Wind Farm, LLC (Applicant) (Horse Heaven Wind Farm, LLC 2022)
- Shadow Flicker Analysis Memorandum provided by Horse Heaven Wind Farm, LLC (Horse Heaven Wind Farm, LLC 2021b)
- Glare Analysis Report provided by the Applicant (Horse Heaven Wind Farm, LLC 2021c)

4.10.1 Method of Analysis

Anticipated visual, lighting, and glare impacts during operation of the Project were quantified and qualified using several methodologies. During construction and decommissioning stages, however, the Project would generate minimal light and glare from vehicles and equipment, and minimal work would be performed during nighttime hours, thus limiting the need for temporary nighttime lighting (Horse Heaven Wind Farm, LLC 2021c). Additionally, solar panel construction is not expected to create glare until the panels are installed; therefore, the construction impacts would be equivalent to the glare generated by the Project. For these reasons, impact analysis for lighting and glare was considered only for the operational phase of the Project. The assessment of anticipated visual aspect effects considered impacts during the construction and decommissioning stages, as these activities would generate visual contrast with the existing setting, which would be visible from identified KOP locations.

4.10.1.1 Visual Aspects Methodology

The analysis of the Project’s visual impacts focuses on three elements: landscape character, viewing locations, and compliance with state and county visual management guidance. The analysis uses the methods developed by the Clean Energy States Alliance (CESA), which suggest three evaluation criteria as they relate to determining whether impacts rise to the magnitude of “undue” or “unreasonable” (CESA 2011):

- Does the project violate a clear written aesthetic standard intended to protect the scenic values or aesthetics of the area or a particular scenic resource?
- Does the project dominate views from highly sensitive viewing areas or within the region as a whole?
- Has the developer failed to take reasonable measures to mitigate the significant or avoidable impacts of the project?

In consideration of the methods developed by CESA and the Bureau of Land Management (BLM), **Table 4.10-2** further describes the degrees of magnitude outlined in **Table 4.10-1** (negligible, low, medium, and high) as they relate to the visual impact analysis performed for the Project. As identified in **Table 4.10-2**, the determination of impact magnitude is based on impacts on landscape character, impacts on viewing locations, and compliance with state and county visual resource requirements. These determinations are primarily informed by the concept of project contrast, which is a measure of the overall visual changes to existing features of the landscape (including landform/water, vegetation, and human-made structures) resulting from the construction, operation, and decommissioning of a project. The level of project contrast is assessed using the categories of slight, weak, moderate, and strong, which directly align with the magnitude of change degrees of negligible, low, medium, and high.

Table 4.10-2: Criteria for Assessing Magnitude of Impacts Related to Visual Aspects

Magnitude of Impacts	Description
Negligible	**Landscape character:** Landscape would appear unaltered and Project components would not attract attention. Project components would repeat form, line, color, texture, scale and/or movement common in the landscape and would not be visually evident. **Viewing locations:** Contrast introduced by the Project would be slight, subordinate to existing landscape features, and not readily seen from viewing locations. Project components would repeat elements or patterns common in the landscape. **State and county visual resource requirements:** The Project would be consistent with state and county visual management requirements.
Low	**Landscape character:** Landscape would be noticeably altered, and Project components would begin to attract attention in a partially intact visual setting. Project components would introduce form, line, color, texture, scale, and/or movement common in the landscape and would be visually subordinate (i.e., have weak contrast). **Viewing locations:** A weak level of contrast would be introduced by the Project. The Project would occupy a small portion of the viewshed and would be subordinate to existing landscape features, as seen from viewing locations. **State and county visual resource requirements:** The Project would be consistent with state and county visual management requirements after implementation of Applicant commitments.
Medium	**Landscape character:** Landscape would appear to be considerably altered, and Project components would begin to dominate a partially intact visual setting. Project components would introduce form, line, color, texture, scale, and/or movement not common in the landscape and would be visually prominent in the landscape (moderate contrast). **Viewing locations:** A moderate level of contrast would be introduced by the Project, attracting attention from viewing locations. The Project would be prominent in the existing landscape and co-dominate from viewing locations where the form, line, color, texture, scale, and/or movement of Project components would be moderately incongruent with existing landscape features. **State and county visual resource requirements:** The Project would be partially consistent with state and county visual management requirements after Applicant commitments.
High	**Landscape character:** Landscape would appear to be strongly altered, and Project components would dominate an intact visual setting. Project components would introduce form, line, color, texture, scale, and/or movement not common in the landscape and would be visually dominant in the landscape (strong contrast). **Viewing locations:** A strong level of contrast would be introduced by the Project, demanding attention. The Project would be highly prominent and dominate views from viewing locations where the form, line, color, texture, scale, and/or movement of Project components would be highly incongruent with existing landscape features, including existing structures. A strong level of contrast may also be introduced if the Project components occupy a large portion of the viewshed from a given viewpoint. **State and county visual resource requirements:** The Project would be inconsistent with state and county visual management requirements after Applicant commitments.

Source: SWCA 2023

Other concepts taken from the CESA methods were used to evaluate and address the unique visual characteristics of wind energy projects. The assessment of impacts on landscape character includes modifications to the existing setting, which may reduce the setting's overall level of intactness. With regard to impacts on views, the concepts of project dominance, prominence within the setting, and extent of viewshed occupied by the Project (i.e., extent of horizontal view occupied by Project) were included from the CESA methods. These concepts build on the BLM Visual Resource Management's 10 environmental factors that influence the amount of visual contrast introduced by a project (BLM 1986):

- Distance
- Angle of observation
- Length of time the project is in view
- Relative size or scale
- Season of use
- Lighting conditions
- Recovery time
- Spatial relationships
- Atmospheric conditions
- Motion

Of particular importance for a project with wind turbines is the influence of motion to attract attention and increase the level of visual contrast within view, compared to static elements (e.g., solar arrays, transmission lines).

To support the visual impact discussions, the following visual terminology is used in this report:

- Viewer position (angle of observation)
  - Inferior: viewer is located below the Project in elevation.
  - Level: viewer is at the same elevation as the Project.
  - Superior: viewer is located above the Project in elevation.
- Project visibility factors
  - Screening: An existing visual barrier (landforms, vegetation, or structures) blocks or limits views of the Project, reducing the level of contrast introduced by the Project.
  - Unobstructed: Views of the Project would not be screened by landforms, vegetation, or structures, allowing for the extent of the Project to be visible.
  - Skylining: The Project would appear above the horizon or ridgeline, silhouetting its form against the sky attracting additional attention in the landscape.

Since impacts on visual resources considered effects on scenery and on views from multiple KOPs, the summary impact level (i.e., magnitude of impact) at the end of each discussion focuses on the highest identified impacts. Visual impacts on cultural resources, including from the perspective of Native American tribes, are described in Section 4.9, Historic and Cultural Resources.

The maximum number of turbines and maximum turbine height carried forward for analysis as components of the Project under Turbine Option 1 and Turbine Option 2 are summarized in **Table 4.10-3**.

Table 4.10-3: Proposed Action Example Wind Turbine Layout and Model Options

Turbine Parameters/Features	Turbine Option 1	Turbine Option 2
Wind Turbine Output	GE 2.82-MW	GE 5.5-MW
Wind Turbine Layout	244 turbines up to a maximum blade tip height of 499 feet[(a)]	150 turbines up to a maximum blade tip height of 671 feet[(a)]
Tower Type	Tubular	Tubular
Turbine Rotor Diameter	417 feet	518 feet
Turbine Hub Height (ground to nacelle)	292 feet	411 feet
Tower Base Diameter	15.1 feet	15.1 feet

Source: Horse Heaven Wind Farm, LLC 2022
Notes:
(a) As proposed in the 2022 ASC, Table 2.3-1
ASC = Application for Site Certification; GE = General Electric; MW = megawatts

Turbine Option 1 is shown in **Figure 4.10-1**, and Turbine Option 2 is shown in **Figure 4.10-2**. The final number of turbines and the specific model used would depend on availability and other considerations at the time of construction.

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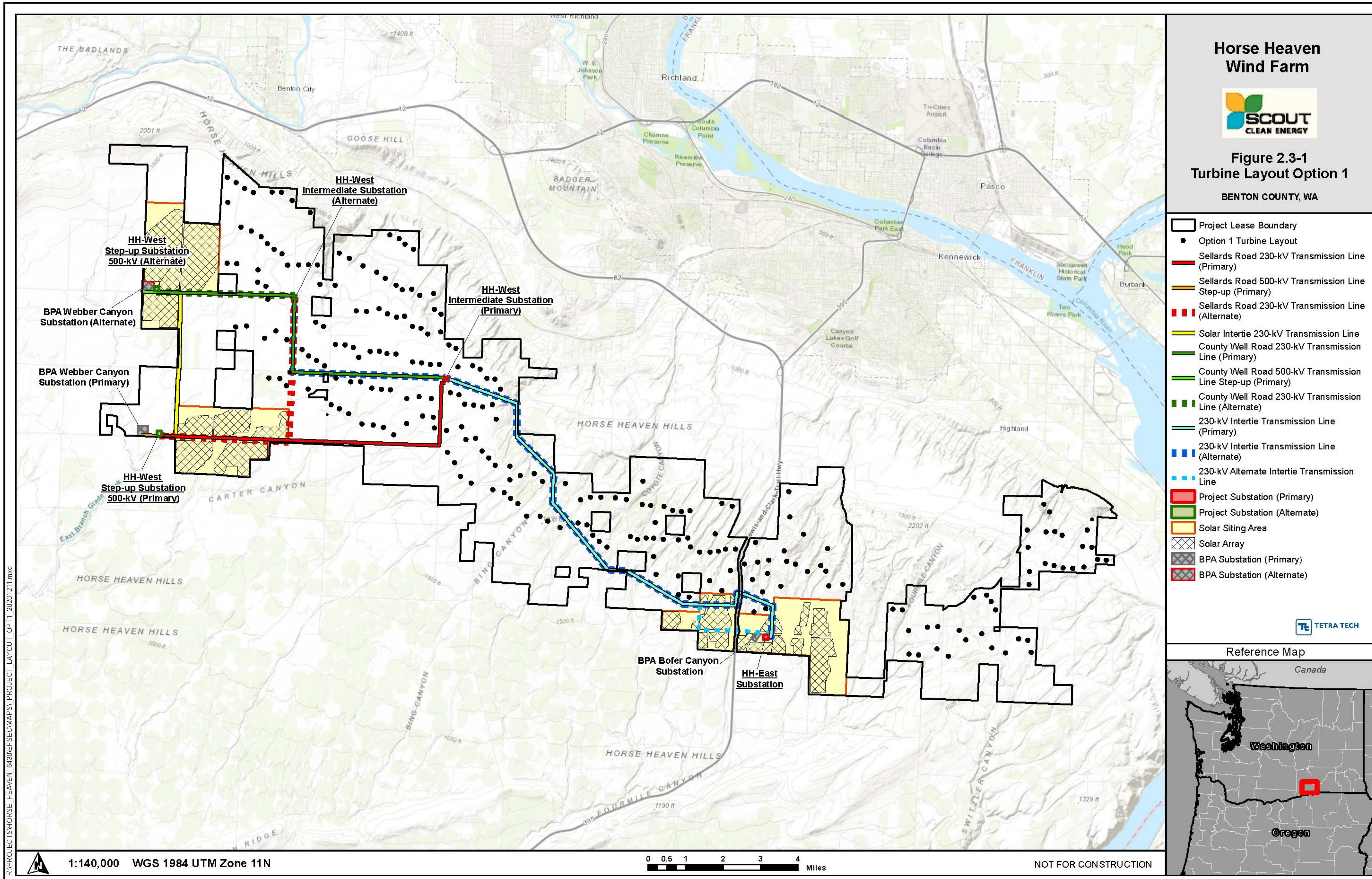
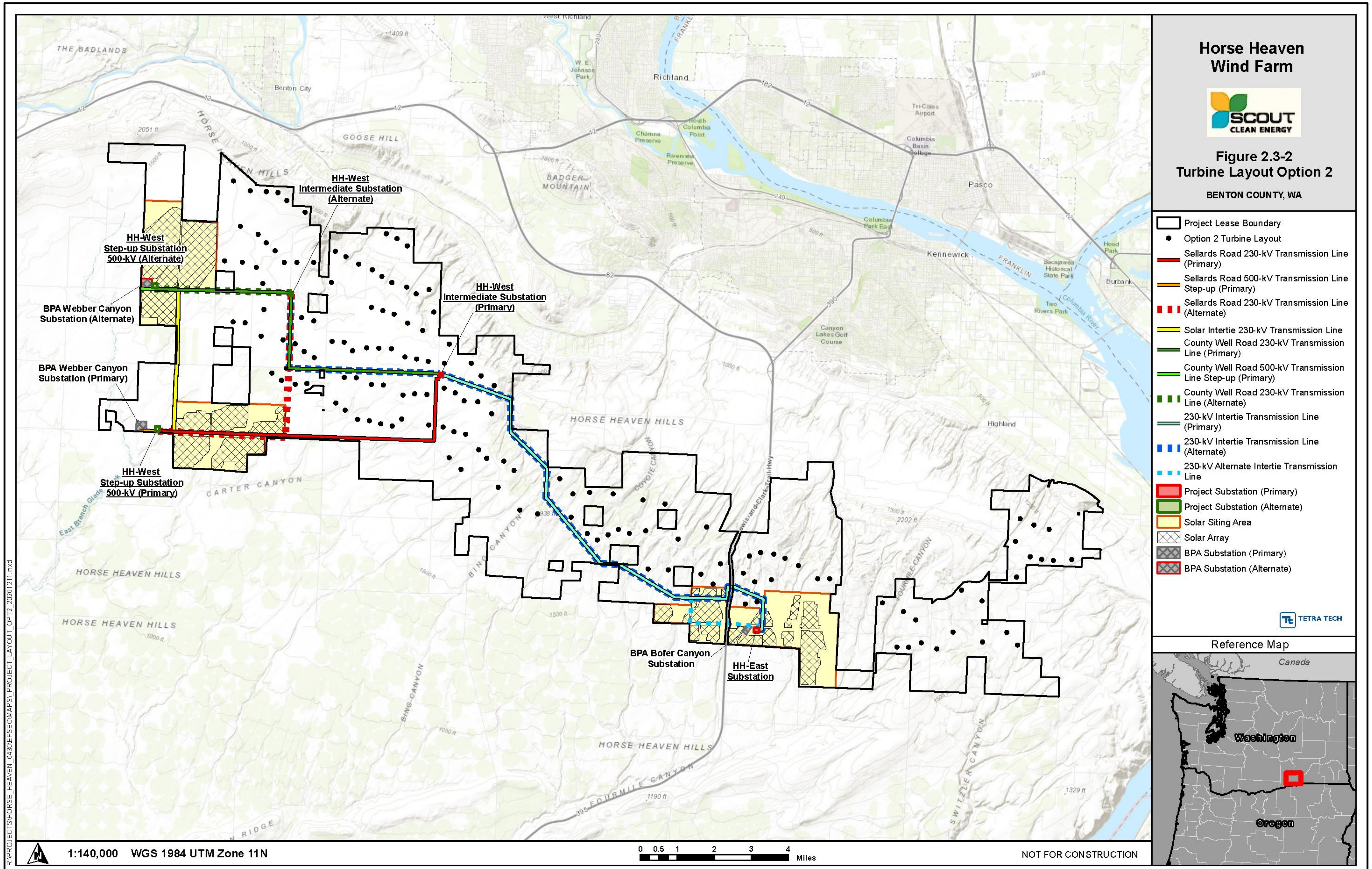


Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.10-1: Turbine Option 1 Layout



Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.10-2: Turbine Option 2 Layout

4.10.1.2 Shadow Flicker Methodology

An analysis of potential shadow flicker impacts from the Project was conducted using the windPRO software package (EMD 2019). The Applicant is considering two different turbine models and two different turbine layouts, which are presented in **Table 4.10-3**, **Figure 4.10-1**, and **Figure 4.10-2**.

This windPRO analysis calculated the total amount of time (hours and minutes per year) that shadow flicker could occur at receptors surrounding the Project's turbines. The calculations were based on the following assumptions:

- The elevation and position geometries of the terrain, turbines, and surrounding receptors were determined using U.S. Geological Survey digital elevation model data (USGS 2017). Position geometries were determined using geographic information system data referenced to Universal Transverse Mercator Zone 11 (North American Datum of 1983).
- The position of the sun and the incident sunlight relative to the turbines and receptors on a minute-by-minute basis over the course of a year.
- The historical sunshine availability (percentage of total hours available). Historical sunshine rates for the area (as summarized by the National Climatic Data Center for Spokane, Washington) used in this analysis are presented in **Table 4.10-4** (NOAA 2019). For the purposes of shadow flicker analysis, Spokane sunshine rates serve as the most representative data set available for the Project that is compatible with the windPRO model.
- Estimated turbine operations and orientation based on on-site measured wind data, including wind speed/ wind direction frequency distribution, measured at a meteorological tower located near the center of the Project site.
- Receptor viewpoints (i.e., house windows) are assumed to always be directly facing the turbine-to-sun line of sight (i.e., "greenhouse mode").

Table 4.10-4: Historical Sunshine Availability by Month for Spokane, Washington

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25%	37%	53%	57%	63%	65%	78%	76%	70%	54%	26%	22%

Source: Horse Heaven Wind Farm, LLC 2021b

The sun's path with respect to each turbine location is calculated by the windPRO software to determine the cast shadow paths every minute over a full year. Since shadow flicker only occurs when at least 20 percent of the sun's disc is covered by the turbine blades, windPRO uses blade dimension data to calculate the maximum distance from the turbine for which shadow flicker must be calculated. A conservative diameter of 558 feet was used for the maximum rotor diameter, resulting in a calculated maximum shadow flicker impact distance of 2,041 meters. Beyond this distance, the turbine would not contribute to the shadow flicker effect. It should be noted, however, that windPRO provides a conservative estimate of shadow flicker as it does not account for obstacles such as trees, haze, and visual obstructions (window facing, coverings) despite the likelihood of their reducing or eliminating shadow flicker impacts on receptors.

A total of 742 structures were identified as occupied or potentially occupied residences within 1.2 miles of the Project Lease Boundary. The 742 residential structures were considered to be potential shadow flicker receptors for the purpose of this analysis. A receptor in the model was defined as a 3- by 3-foot area (approximately the size of a typical window), 3 feet above ground level. Approximate eye level was set at 5 feet. The locations of all 742 shadow flicker receptors, along with the potential Project turbine locations for Turbine Option 1 are presented in **Figure 4.10-9**.

In consideration of health impacts and industry standards, **Table 4.10-5** further describes the degrees of magnitude outlined in **Table 4.10-1** (negligible, low, medium, and high) as they relate to the light impact analysis elements that form the foundation of this assessment. As identified in **Table 4.10-5**, the determination of impact magnitude is based on flicker rates (flashes per second) and annual expected hours of exposure. The higher the flicker rate and the longer the expected hours of exposure, the greater the magnitude of impact.

Table 4.10-5: Criteria for Assessing Magnitude of Impacts from Shadow Flicker

Magnitude of Impacts	Description
Negligible	**Flicker Rates:** No flicker would be observed; therefore, the flicker rate would be zero flashes per second; -and- **Exposure:** Flicker would not be observed at these locations; therefore, zero hours of exposure.
Low	**Flicker Rates:** Flicker would be observed below 3 flashes per second at receptors; -and/or- **Exposure:** Flicker would be observed at receptors between 0 and 30 hours per year.
Medium	**Flicker Rates:** Flicker would be observed at or above 3 flashes per second at sensitive receptors; -or- **Exposure:** Flicker would be observed at sensitive receptors for 30 hours per year or more.
High	**Flicker Rates:** Flicker would be observed at or above 3 flashes per second at sensitive receptors; -and- **Exposure:** Flicker would be observed at sensitive receptors for 30 hours per year or more.

Sources: Lampeter 2011; Epilepsy Action 2022

4.10.1.3 Light Methodology

The assessment of Project-related lighting involved a review of available Project information. This information provided an estimate of the potential incremental increase in lighting that may result from the Project and would influence the current sky glow level. This incremental change, combined with assumed brightness above natural dark sky background at light receptors, was used to determine if anticipated light levels within the Project would exceed thresholds and categories for Environmental Lighting Zones (ELZ). A change in an ELZ class would signal a noticeable change in the perceived lighting conditions experienced by viewers at night.

A determination of existing light trespass, which is light or illuminance that strays from its intended purpose and potentially becomes an annoyance to nearby receptors, was qualified by assuming the amount of light trespass based on population density and surrounding land uses.

In consideration of Commission Internationale de l'Eclairage (CIE) guidelines and light trespass considerations, **Table 4.10-6** further describes the degrees of magnitude outlined in **Table 4.10-1** (negligible, low, medium, and high), as they relate to the light impact analysis elements that form the foundation of this assessment. As identified in **Table 4.10-6**, the determination of impact magnitude is based on sky glow and light trespass. These determinations are primarily informed by the brightening of the natural sky background level and the emission of light from a light source onto an adjoining property resulting from the construction, operation, and decommissioning of a project.

Table 4.10-6: Criteria for Assessing Magnitude of Impacts from Light

Magnitude of Impacts	Description
Negligible	**Light Trespass:** No observable light from the Proposed Action at off-site receptors. -and- **Sky Glow:** No degradation of sky glow.
Low	**Light Trespass:** Observable light from the Proposed Action at off-site sensitive receptors property that would not be measurable or otherwise increase lighting on that property. -and/or- **Sky Glow:** Minimal degradation of sky glow, with no change ELZ classification at non-sensitive receptors.
Medium	**Light Trespass:** Observable and measurable light from the Proposed Action at off-site dwellings. -or- **Sky Glow:** Degradation of sky glow, resulting in a change ELZ classification at non-sensitive receptors.
High	**Light Trespass:** Observable and measurable light from the Proposed Action at off-site dwellings. -and- **Sky Glow:** Degradation of sky glow, resulting in a change ELZ classification at sensitive receptors.

Source: CIE 1997
ELZ = Environmental Lighting Zones

4.10.1.4 Glare Methodology

The Solar Glare Hazard Analysis Tool (SGHAT) is considered to be an industry best practice for analysis of glare related to solar energy generating facilities. Tetra Tech utilized the SGHAT technology as part of an online tool (GlareGauge) developed by Sandia National Laboratories (Sandia) and hosted by ForgeSolar. GlareGauge provides a quantitative assessment of the following (ForgeSolar 2020):

- When and where glare has the potential to occur throughout the year for a defined solar array polygon
- Potential effects on the human eye at locations where glare is predicted

The following statement was issued by Sandia regarding the SGHAT technology:

> *"Sandia developed SGHAT v. 3.0, a web-based tool and methodology to evaluate potential glint/glare associated with solar energy installations. The validated tool provides a quantified assessment of when and where glare will occur, as well as information about potential ocular impacts. The calculations and methods are based on analyses, test data, a database of different photovoltaic module surfaces (e.g., anti-reflective coating, texturing), and models developed over several years at Sandia. The results are presented in a simple easy-to-interpret plot that specifies when glare will occur throughout the year, with color indicating the potential ocular hazard (Sandia 2016)."*

Note, however, that technology changes continue to occur to address issues such as reflectivity. The model, therefore, presents a conservative assessment based on simplifying assumptions inherent in the model, as well as industry improvements since the most recent update of such assumptions. See **Appendix 4.10-1**.

Based on the predicted retinal irradiance (i.e., intensity) and subtended angle (i.e., size/distance) of the glare source to receptor, the GlareGauge categorizes potential glare where it is predicted by the model to occur in accordance with three tiers of severity (i.e., ocular hazards) that are shown by different colors in the model output:

- Red glare: glare predicted with a potential for permanent eye damage (i.e., retinal burn)
- Yellow glare: glare predicted with a potential for temporary after-image
- Green glare: glare predicted with a low potential for temporary after-image

These categories of glare are calculated using a typical observer's blink response time, ocular transmission coefficient (i.e., the amount of radiation absorbed in the eye prior to reaching the retina), pupil diameter, and eye focal length (i.e., the distance between the retina and the place where rays intersect in the eye). As a point of comparison, direct viewing of the sun without a filter is considered to be on the border between yellow glare and red glare, while typical camera flashes are considered to be lower tier yellow glare (i.e., approximately three orders of magnitude less than direct viewing of the sun). Upon exposure to yellow glare, the observer may experience a spot in their vision temporarily lasting after the exposure. Upon exposure to green glare, the observer may experience a bright reflection but typically no spot lasting after exposure.

In consideration of Federal Aviation Administration (FAA) regulations and glare intensity outlined, **Table 4.10-7** further describes the degrees of magnitude outlined in **Table 4.10-1** (negligible, low, medium, and high), as they relate to the glare impact analysis elements that form the foundation of this assessment. As identified in **Table 4.10-7**, the determination of impact magnitude is based on impacts of glare on air travel, on road travel, and at observation points.

Table 4.10-7: Criteria for Assessing Magnitude of Impacts from Glare

Magnitude of Impacts	Description
Negligible	No potential for glare at off-site receptors or at existing or planned air traffic control tower cabs.
Low	Green glare: glare predicted with a low potential for temporary after-image at off-site receptors, at traffic control tower cabs, or along the final approach path for any existing landing threshold or future landing thresholds.
Medium	Yellow glare: glare predicted with a potential for temporary after-image at off-site receptors, at traffic control tower cabs, or along the final approach path for any existing landing threshold or future landing thresholds.
High	Red glare: glare predicted with a potential for permanent eye damage (i.e., retinal burn) at off-site receptors, at traffic control tower cabs, or along the final approach path for any existing landing threshold or future landing thresholds.

Sources: Sandia 2016; ForgeSolar 2020

4.10.1.5 Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC

(Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on visual resources are discussed in Section 2.1.3 and summarized below.

Visual Aspects

To reduce impacts on landscape character and views and to minimize any incompatibility with state and local visual management requirements, the Applicant has developed a series of best management practices (BMPs) and other mitigation measures as part of the Project's 2022 ASC. Many of these BMPs, as well as the design of the Project, incorporate mitigation measures outlined in the BLM's Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands (BLM 2013) and CESA's visual impact assessment process (CESA 2011), including (but not limited to) the following:

- Considering topography when siting wind turbines, including less rigid turbine configurations in rolling terrain responding to local topography
- Clustering or grouping turbines to break up long lines of turbines
- Striving to create visual order and unity among turbine clusters
- Maintaining operational turbines and other Project components
- Preparing an effective decommissioning plan
- Selecting appropriate paint and finish to match the existing setting

The impacts assessment also includes two different turbine options to compare one design that includes a larger number of smaller turbines (Option 1) to a design with fewer, taller turbines (Option 2). Due to the siting and operating requirements for wind turbines, there are limited mitigation measures that would considerably reduce impacts on visual resources beyond reducing the number of turbines in view. The use of the following Applicant-committed mitigation in the Project design, construction, operation, and decommissioning stages would both directly and indirectly reduce impacts on visual resources:

- Active dust suppression would be implemented during construction.
- Following completion of construction, temporarily disturbed areas (e.g., laydown yards, crane paths not used as Project access roads) would be returned to their previous conditions once construction is complete.
- Restoration of the laydown yards would involve preconstruction stripping and storing of topsoil (including weed avoidance), removing the gravel surface, regrading to preconstruction contours, restoring topsoil and de-compacting subsoils as needed, and reseeding with approved seed mixes.
- Following completion of construction, the temporary crane paths would be removed and the area restored in accordance with the Project's Revegetation and Noxious Weed Management Plan.
- The Applicant would provide a clean-looking facility free of debris and unused or broken-down equipment by storing equipment and supplies in designated areas within the operations and maintenance (O&M) facilities and promptly removing damaged or unusable equipment from the site.
- The turbines and solar arrays would be uniform in design to present a trim, uncluttered, aesthetically attractive appearance.

- The Applicant would construct support facilities with non-reflective materials in muted tones and would use white or light gray, non-reflective paint to minimize the need for daytime aviation lighting and eliminate glare from the turbines.
- After construction is completed, vegetated areas that are temporarily disturbed or removed during construction of the Project would be restored to pre-disturbance conditions as reasonably possible, in accordance with the Revegetation and Noxious Weed Management Plan.

Shadow Flicker

The Applicant has not proposed any mitigation measures for shadow flicker.

Light

For the security lighting for the solar arrays, substations, and BESS, the Applicant has committed to using the following:

- During construction, to the extent feasible, lighting would be directed toward construction activities and away from roadways or residences.
- Sensors and switches would be used to keep security lighting turned off when not required.
- All lights except aviation safety lighting would be hooded and directed downward to minimize light pollution.
- Any perimeter lighting at the O&M facilities and BESS would be activated only during maintenance or emergency activities at night.

Glare

The Applicant has committed to the following:

- The turbine towers would be painted off-white with a non-reflective coating, in accordance with FAA regulations.
- Solar arrays would have an anti-reflection coating.

Post-adjudication Applicant commitments were identified and finalized in the Applicant’s Final ASC (Horse Heaven Wind Farm, LLC 2023b). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.10.2.5, Post-Adjudication Applicant Commitments.

4.10.1.6 Application of Impact Assessment to Project Components

The four types of potential visual or aesthetic impacts from the Proposed Action are not uniformly applicable to all Project components (for example, BESS are not a potential source of shadow flicker). **Table 4.10-8** identifies the impact type analyzed for Project components.

Table 4.10-8: Impact Analysis Applicable to Project Component

Project Component	Visual Aspects	Shadow Flicker	Light	Glare
Turbine Option 1	A	A	A	NA
Turbine Option 2	A	A	A	NA
Solar Arrays	A	NA	A	A

Table 4.10-8: Impact Analysis Applicable to Project Component

Project Component	Visual Aspects	Shadow Flicker	Light	Glare
Substations and Transmission Lines	A	NA	A	NA
Battery Energy Storage System	A	NA	A	NA
Comprehensive Project	A	A	A	A

Notes:
A = Potential impact type is applicable to Project component.
NA = Potential impact type is not applicable to Project component.

4.10.2 Impacts of Proposed Action

4.10.2.1 Impacts during Construction

The construction of the Project would introduce form, line, color, texture, scale, light, glare, and movement inconsistent with the existing landscape character and would modify views from the identified KOP locations. These short term impacts would result from construction of Project facilities, as well as new access roads and associated vegetation clearing. Because the Applicant has committed to active dust suppression, as described in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022; Section 1.10, Mitigation Measures), potential visual impacts associated with visible dust plumes are not considered in this assessment. A summary of impacts during construction is provided in **Table 4.10-14a**, with a more detailed analysis following.

Turbine Option 1

Visual Aspects

Impacts on visual resources would be elevated during construction activities, including the movement of vehicles that would attract attention, due to increased activity at temporary staging areas and throughout the Lease Boundary. The construction of access roads, crane paths, collector and communication lines, and wind turbines would be prominent when viewed within the foreground distance zone (0 to 0.5 miles) and would modify the existing landscape setting.

During construction, the removal of vegetation and earthwork would introduce areas of exposed soil, which would contrast with the existing setting until the area has been revegetated. The construction of access roads in the level to rolling terrain in the analysis area would require minimal modification of the existing terrain, resulting in negligible long term visual impacts. Impacts common to all KOPs during construction would include views of additional vehicular traffic and areas of exposed soil after the removal of vegetation and during earthwork activities. Viewers in the foreground distance zone (0 to 0.5 miles), or in locations where views would be occupied by a large portion of the Project under construction, would result in increased visual contrast in these views.

These impacts would be most intense during the 23-month construction schedule (as described in the 2022 ASC and in Chapter 2 of this EIS) and would diminish after construction is complete and vegetation has been re-established. Following the initial seeding, completed after construction, the Applicant would continue to monitor these revegetation areas for a minimum of three years and apply remedial actions to meet the success criteria outlined in Appendix N of the 2022 ASC (Horse Heaven Wind Farm, LLC 2022). Construction activities for Turbine Option 1 would have medium, short term, probable, local impacts on visual resources.

Light

The Project would generate minimal light during construction under Turbine Option 1 from vehicles and equipment. Construction work would be concentrated during daylight hours, minimizing or eliminating the potential need for temporary nighttime lighting. Given this, light from construction would have negligible, temporary, unlikely, and limited impacts on off-site or sensitive receptors.

Glare

Similar to lighting, construction under Turbine Option 1 would generate minimal glare from vehicle and equipment windshields or glass enclosures. Therefore, glare from construction under this option would have low, temporary, feasible, and confined impacts on off-site or sensitive receptors.

Turbine Option 2

Visual Aspects

Impacts would be similar to Turbine Option 1. Because Option 2 would involve fewer wind turbines and require less ground disturbance for construction, it would result in less contrast and fewer modifications to the existing landscape character introduced during Project construction when compared to Turbine Option 1. However, the ratings of impacts are consistent between the two turbine options as construction of either option would occupy a large portion of the landscape, contrasting with its existing character. Construction activities for Turbine Option 2 would have medium, short term, probable, local impacts on visual resources.

Light

The Project would generate minimal light related to vehicles and equipment during construction under Turbine Option 2. Construction work would be concentrated during daylight hours, minimizing or eliminating the potential need for temporary nighttime lighting. Given this, light from construction would have negligible, temporary, unlikely, and limited impacts on off-site or sensitive receptors.

Glare

Similar to lighting, construction under Turbine Option 2 would generate minimal glare from vehicle and equipment windshields or glass enclosures. Therefore, glare from construction under this option would have low, temporary, feasible, and confined impacts on off-site or sensitive receptors.

Solar Arrays

Visual Aspects

The construction of the solar arrays would result in impacts similar to those of the wind turbines but would occur within a smaller, more defined area associated with the selected solar array site. Within the fenced boundary, all lands would be disturbed through earthwork, vegetation clearing, and other construction efforts. Application of mitigation measures would reduce these impacts to the extent practicable to minimize these short term visual impacts, as described in Section 4.10.2.4. Construction activities for the solar arrays would have low, short term, probable, local impacts on visual resources.

Light

The Project would generate minimal light related to vehicles and equipment during construction of the solar arrays. Construction work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, light from construction of this Project component would have negligible, temporary, unlikely, and limited impacts on off-site or sensitive receptors.

Glare

Similar to light, the Project would generate minimal glare during construction of solar arrays from vehicle and equipment windshields or glass enclosures. Installation of the solar arrays would cause glare for a short time before construction ends and operation begins. Therefore, glare from construction of this Project component would have low, temporary, feasible, and confined impacts on off-site or sensitive receptors.

Battery Energy Storage Systems

Visual Aspects

Impacts related to construction of the BESS would be similar to those of the solar arrays and substations, with the proposed BESS sites located adjacent to the proposed substation locations. Construction of the BESS would introduce additional motion from construction equipment into the setting. Additionally, the removal of vegetation and earthwork would introduce areas of exposed soil, which would contrast with the existing setting until vegetation has been restored. Construction activities for the BESS would have low, short term, probable, local impacts on visual resources.

Light

Vehicles and equipment used for construction of the BESS would generate minimal light. Construction work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, light from construction of this Project component would have negligible, temporary, unlikely, and limited impacts on off-site or sensitive receptors.

Glare

Similar to lighting, construction of BESS would generate minimal glare from vehicle and equipment windshields or glass enclosures. Therefore, glare from construction of this Project component is expected to have low, temporary, feasible, and confined impacts on off-site or sensitive receptors.

Substations and Transmission Lines

Visual Aspects

Impacts from construction of the substations would be similar to the solar arrays, with the addition of multiple linear transmission lines connecting the substations to the existing electrical grid. The construction of the transmission lines would include vegetation clearing within the right-of-way and construction of a series of tall, vertical structures. During construction, the motion associated with construction equipment, structure building, and conductor stringing, as well as vegetation clearing and landform modification would be noticeable and create visual contrast within the viewshed. Construction activities for the substations and transmission lines would have, low, short term, probable, local impacts on visual resources.

Light

The Project would generate minimal light during the construction of substations and transmission lines from vehicles and equipment. Construction work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, light from construction of this Project component would have negligible, temporary, unlikely, and limited impacts on off-site or sensitive receptors.

Glare

Similar to lighting, substation and transmission line construction would generate minimal glare from vehicle and equipment windshields or glass enclosures. Therefore, glare from construction of this Project component would have low, temporary, feasible, and confined impacts on off-site or sensitive receptors.

Comprehensive Project

Visual Aspects

During the 23-month construction schedule, there would be short term impacts from construction activities occupying a large portion of the landscape when considering all of the Project components combined (i.e., wind turbines, solar arrays, collector lines, access road, multiple transmission lines and substations, O&M facility, and the BESS). This would include views, glare, and lighting of additional vehicular traffic, as well as areas of exposed soil after the removal of vegetation and during earthwork activities. The removal of vegetation would be noticeable in the setting and contrast with the existing character; however, over time, after the temporary disturbance areas have been revegetated, vegetation patterns would begin to repeat those common in the area.

Viewpoints and KOPs located within the foreground distance zone (0 to 0.5 miles) would be most impacted by the construction of multiple Project components, particularly when a large portion of their viewshed is occupied by construction activities. These short term impacts are anticipated to extend beyond the neighboring receptors, resulting in potential regional impacts from more distant viewpoints where concurrent construction activities associated with multiple project components would occupy a large portion of their viewshed. Construction disturbance would be limited to the extent practicable in accordance with BMPs and the Project's site certificate conditions. After construction is completed, areas of temporary disturbance, including temporary access roads no longer used as Project access roads, would be restored to appear similar to their original condition. In general, vegetated areas that are temporarily disturbed or removed during construction of the Project would be revegetated to blend with adjacent undisturbed lands, and these areas would be monitored for a minimum of three years postconstruction to meet a series of success criteria outlined in the Project's Revegetation and Noxious Weed Management Plan (Horse Heaven Wind Farm, LLC 2022; Appendix N). Areas with soil compaction and disturbance from construction activities would also be revegetated in accordance with the Project's Revegetation and Noxious Weed Management Plan.

In summary, activities during construction of all components of the Project would result in medium, short term, probable, regional impacts on visual resources.

Light

During the construction stage of the Project, work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting from vehicles, equipment, or temporary lighting. Additionally, construction at any given location would be temporary, as construction activities would move across the site from location to location and would not remain at any single location for the duration of the construction stage. Therefore, light from construction of this Project component would have negligible, temporary, unlikely, and limited impacts on off-site or sensitive receptors.

Glare

Similar to lighting, the Project would generate minimal glare during the construction stage from vehicle and equipment windshields or glass enclosures. Glare from solar panels during installation would cause glare for a short time before construction ends and operation begins. Therefore, glare from construction of the Project components combined is expected to have low, temporary, feasible, and confined impacts on off-site or sensitive receptors.

4.10.2.2 Impacts during Operation

The introduction of the Project into the setting would result in long term modifications to the existing landscape's form, line, color, texture, and shadow flicker and would modify views from the identified KOP locations to varying degrees. Project operation would also introduce new sources of light and glare. Although visual impacts would depend on a variety of viewing conditions, the impacts would tend to change considerably with distance. These effects would be most impactful on residential, travel route, and recreational viewers located within the foreground distance zone (0 to 0.5 miles) where the Project would create strong vertical and horizontal forms and lines that would contrast with the primarily organic forms of the existing setting. There are 15 residences, mostly located on participating properties, that would have foreground views (less than 0.5 miles) of the turbines and/or solar arrays. Two residences on non-participating properties would have foreground views of the turbines, while no residences on non-participating properties would have views of the solar arrays. One residence on a participating property would have foreground views of both the turbines and solar arrays, while an additional two residences on participating properties would have foreground views of the solar arrays. The remaining ten residences on participating properties would have foreground views of the turbines.

Impacts on views from the middle ground (0.5 to 5 miles) would vary based on the extent of existing modifications in view. For locations with views of the existing Nine Canyon Wind Project, or where the existing transmission lines already dominate the view, the Project would typically result in medium impacts and would be viewed as co-dominant within the existing setting. From viewpoints where existing modifications do not currently attract attention, the Project would dominate views since a large portion of the viewshed would typically be occupied by large, spinning wind turbines. From this distance, the individual turbines tend to visually "merge" with other turbines in the string from some viewing angles, resulting in the turbines appearing larger in mass and scale.

From more distant views, within the background distance zone (more than 5 miles away), the wind turbines would appear as vertical lines with a faint spinning motion of the blades, particularly when seen skylined above ridges or other highpoints within the landscape. The solar arrays and other Project components would be mostly indiscernible from the background distance zone.

See **Figures 4.10-3 through 4.10-8** for the results of the viewshed analyses by Project component. A summary of impacts during operation is provided in **Table 4.10-14b**, with a more detailed analysis following.

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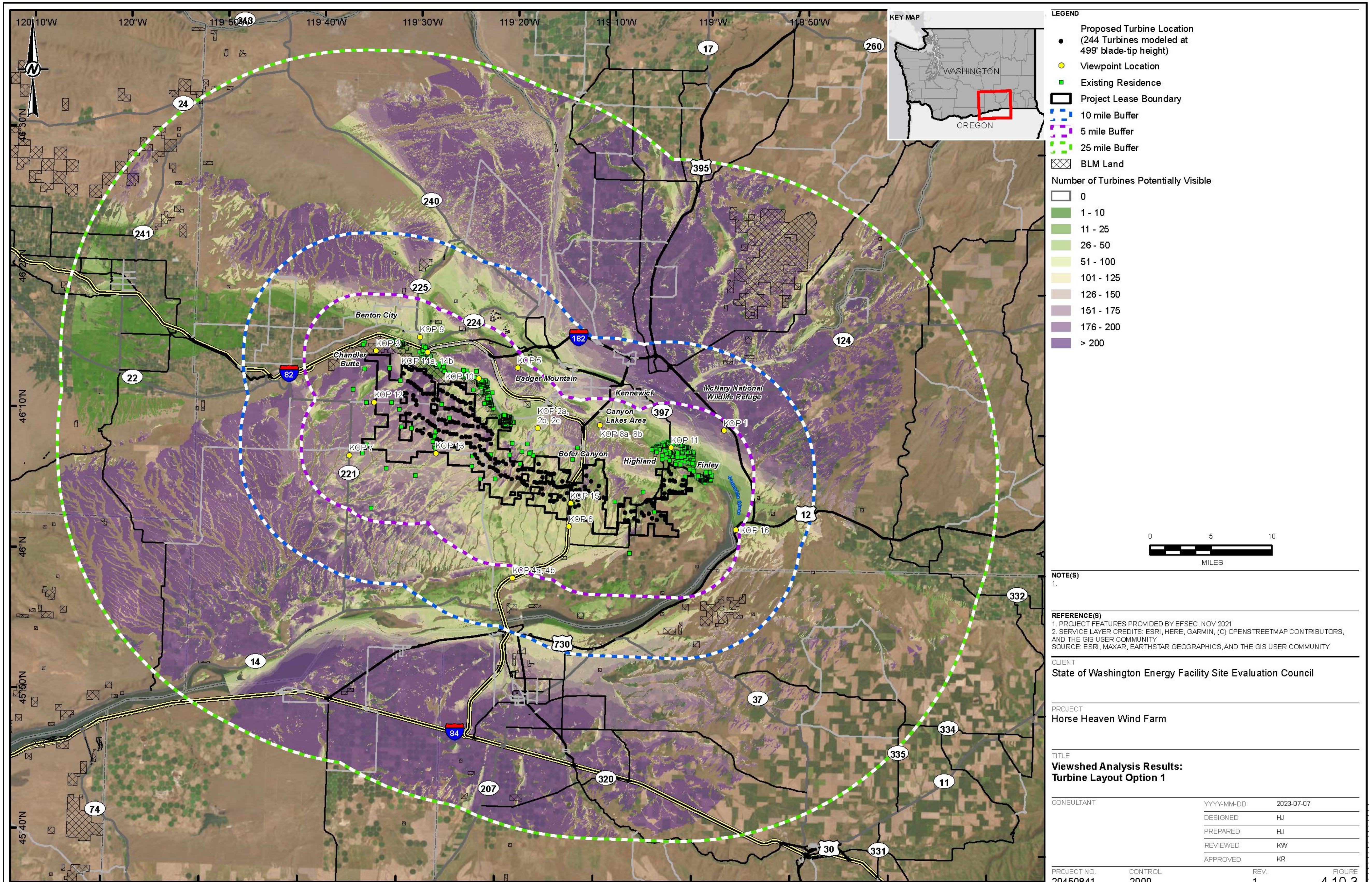
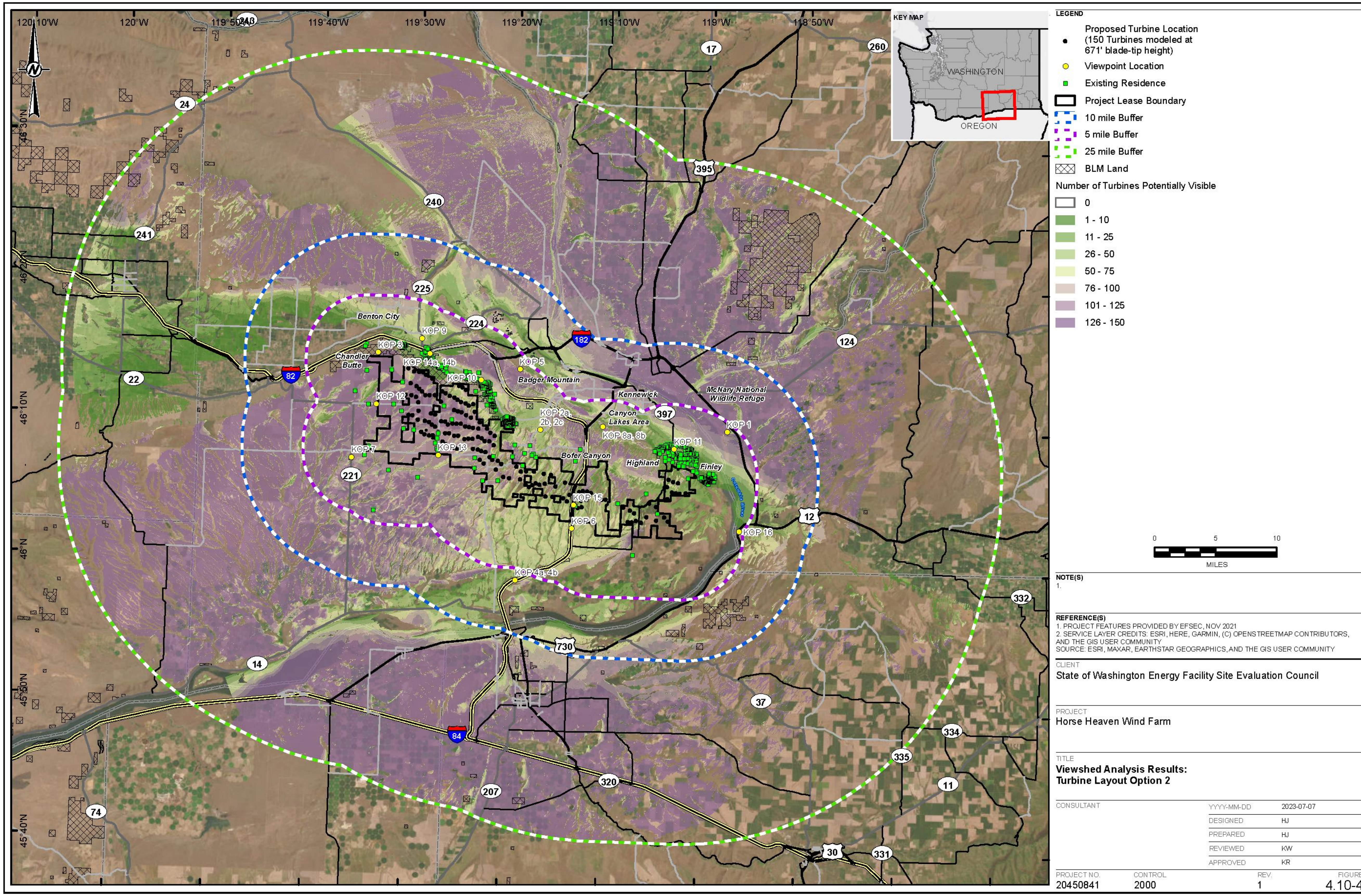


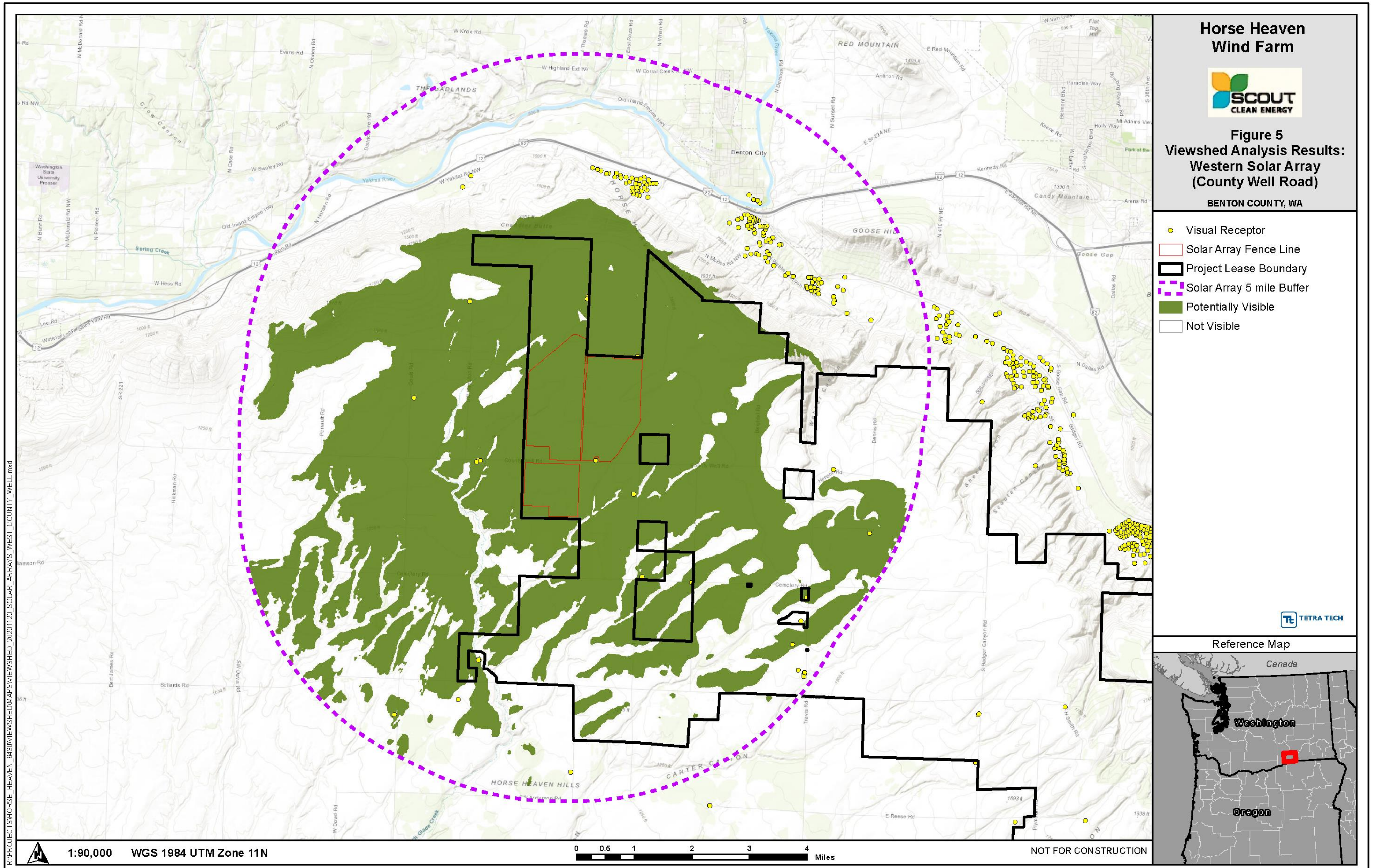
Source: SWCA 2023

Figure 4.10-3: Viewshed Analysis Results: Turbine Layout Option 1



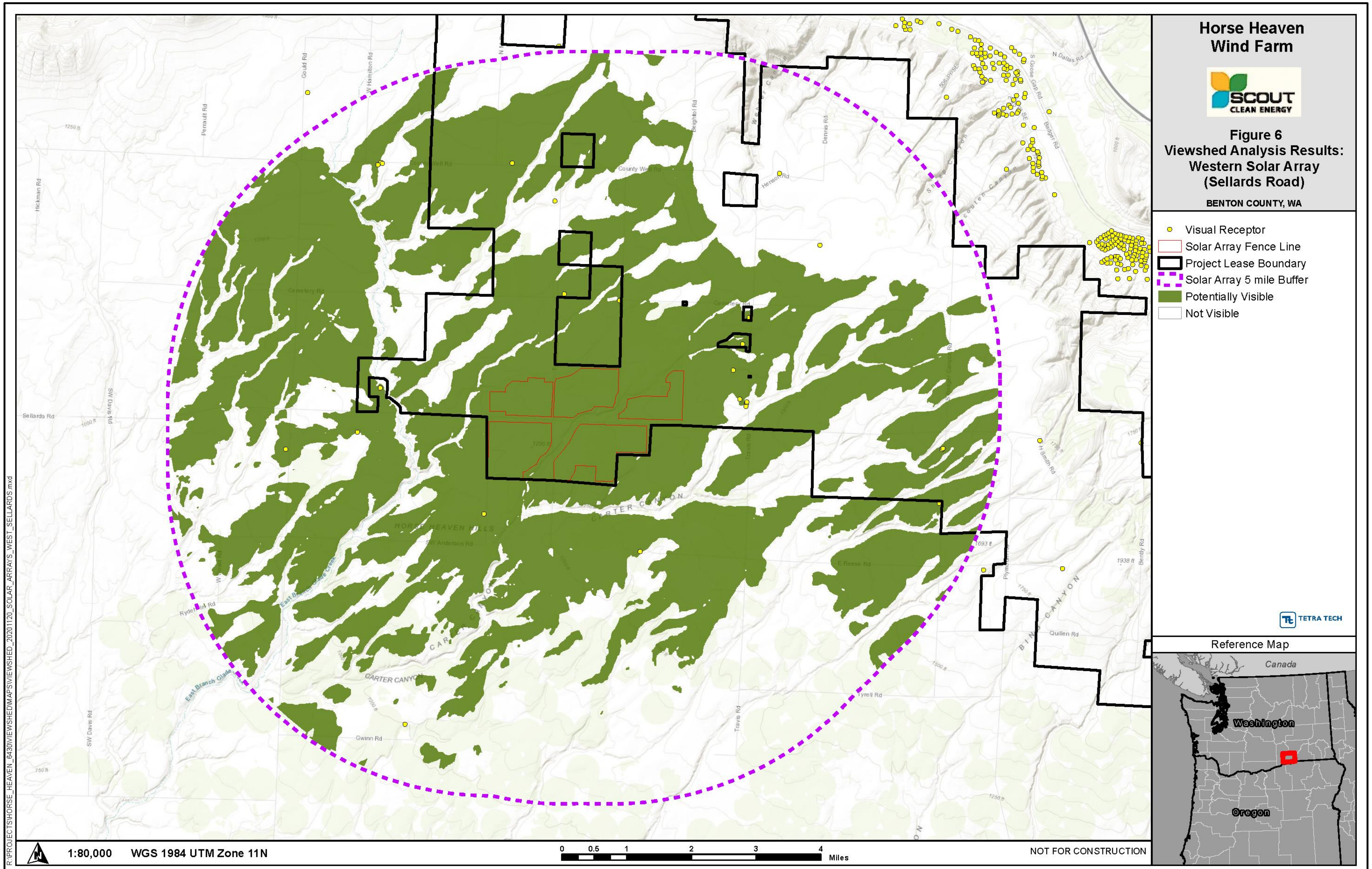
Source: SWCA 2023

Figure 4.10-4: Viewshed Analysis Results: Turbine Layout Option 2

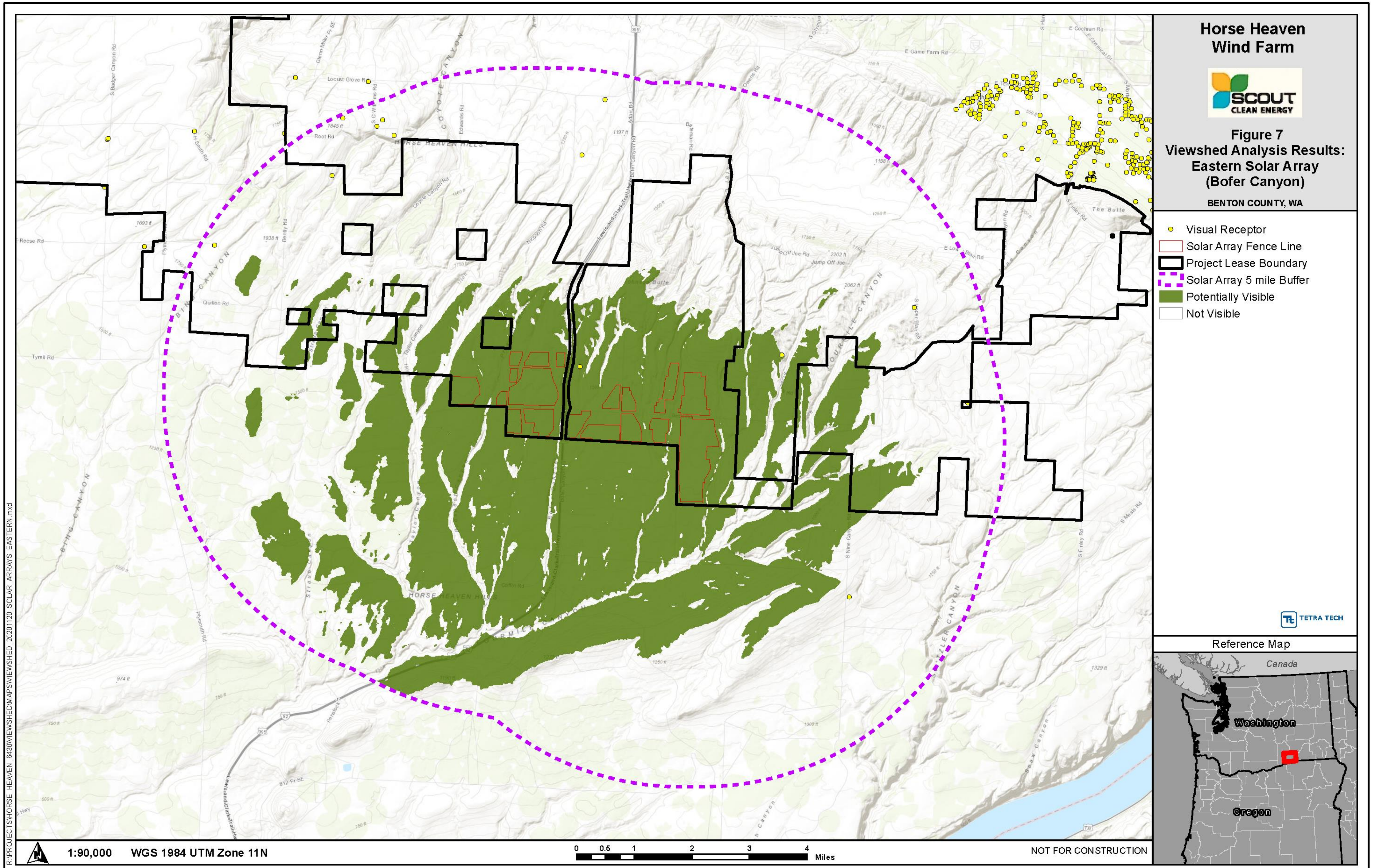


Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.10-5: Viewshed Analysis Results: Western Solar Array (County Well Road)

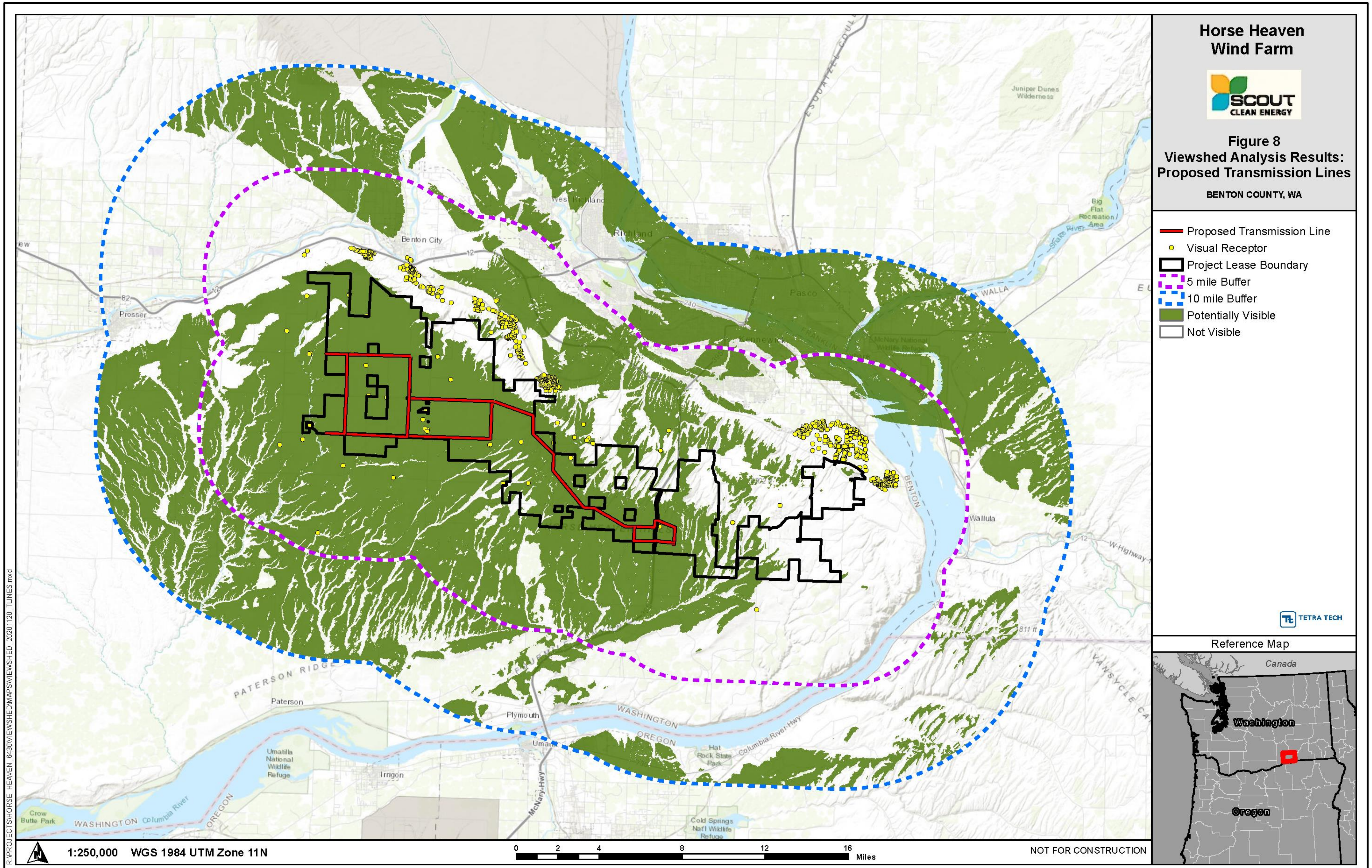


Source: Horse Heaven Wind Farm, LLC 2022
Figure 4.10-6: Viewshed Analysis Results: Western Solar Array (Sellards Road)



Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.10-7: Viewshed Analysis Results: Eastern Solar Array (Bofer Canyon)



Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.10-8: Viewshed Analysis Results: Proposed Transmission Lines

Turbine Option 1

Visual Aspects

Under Turbine Option 1, impacts on landscape character would range from medium to high. The Project would generally dominate the existing landscape character through the introduction of a large number of vertical protrusions that would be out of scale with and highly prominent in the landscape. The turbines would be most prominent where sited near the Horse Heaven Hills ridgeline, resulting in high impacts on landscape character. These structures would also introduce spinning movement into the landscape, which would attract attention throughout the area of analysis—particularly where the existing Nine Canyon Wind Project is not visible. Impacts on landscape character would be medium near the existing Nine Canyon Wind Project, since this portion of the landscape—particularly the area east of I-82—has already been modified. In general, the existing level of landscape intactness would be diminished, resulting in landscapes characterized by energy generation, compared to the existing agrarian landscape character.

Impacts on key views would range from medium to high. **Table 4.10-9** provides an overview of the impacts from each KOP/viewpoint and includes the viewer position, extent of the horizontal view occupied by the Project, level of contrast, and magnitude of impact.

In summary, activities during operation under Turbine Option 1 would result in areas of high, long term, unavoidable, regional impacts on visual resources.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
1	McNary NWR	Recreation	5.2 miles	Inferior	80 degrees	Moderate	Medium	The proposed turbines would be similar in appearance to the existing Nine Canyon Wind Project, also visible from this location, but the proposed turbines would be larger and out of scale with the existing landscape. Views would be unobstructed toward the Lease Boundary. The prominence of the proposed wind turbines rising above the landscape, including additional motion introduced by the spinning turbine blades, would further attract attention from viewers and dominate the existing landscape character. Because visitors and travelers would be visiting for a limited time, the level of contrast would be reduced by the short view duration, limiting the influence of the Project on these views. The Project would expand the extent of view occupied by moving wind turbines and would be prominent from this inferior viewing angle, resulting in medium, long term impacts on views.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [a]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
2	S Clodfelter Road – East, Central, and West	Residential	3.0 miles	Inferior	200 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 3 miles away, as a large portion of the viewshed would include moving wind turbines. Views of the Project in open, rolling hills would be unobstructed. Views toward the east would include the existing Nine Canyon Wind Project, which occupies only a narrow portion of the landscape as viewed from this location. The series of proposed skylined wind turbines would be highly prominent in the view, resulting in high, long term impacts on views, particularly where views of multiple wind turbines would overlap and appear larger in mass.
3	Chandler Butte	Recreation	2.5 miles	Superior	50 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 2.5 miles away, as a moderate portion of the viewshed would include moving wind turbines. Views of the Project in an open plains landscape would be unobstructed, with views of the existing Nine Canyon Wind Project occurring approximately 20 miles away on the distant hills. Due to the superior viewing angle, the contrast between the light color of the turbines and the agricultural fields would create strong visual contrast, visible to recreationists along Chandler Butte. The series of proposed wind turbines would be highly prominent in the view, resulting in high, long term impacts on views, particularly where views of multiple wind turbines would overlap and appear larger in mass.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
4	I-82 South	Travel route	7.0 miles	Inferior	100 degrees	Moderate	Medium	The proposed turbines would attract attention from this location, approximately 7 miles away, as a large portion of the viewshed would include moving wind turbines. Due to the distance, the turbine's form would be distinguishable, but the texture and color would be muted and less detailed. Views from I-82 include an existing transmission line and the Nine Canyon Wind Project, approximately 12 miles away, with these existing features influencing but not dominating views from this location. As travelers drive on I-82 from this point to KOP 6, approximately 10 miles, impacts on views of the proposed wind turbines would incrementally increase. From this location, the turbines would be viewed unobstructed and skylined, which would attract attention, particularly where only moving turbine blades would be seen over the horizon. The impacts on these views would be medium and long term.
5	Badger Mountain	Recreation	4.7 miles	Level	150 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 5 miles away, as a large portion of the viewshed would include moving wind turbines. Views of the Project in open, rolling hills would be unobstructed, occurring beyond developed lands of Badger and the Horse Heaven Hills ridgeline. The series of proposed skylined wind turbines would be highly prominent in the view, resulting in high, long term impacts on views, particularly where views of multiple wind turbines would overlap and appear larger in mass.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
6	Bofer Canyon Road/I-82	Travel route	1.7 miles	Level	120 degrees	Strong	High	The proposed turbines would be viewed within the context of an existing transmission line from this KOP. The existing transmission line has introduced strong vertical lines into the existing setting. Due to the proximity of the proposed turbines (less than 2 miles), the introduction of movement into the landscape, and the extent of view occupied by these structures, the Project would dominate views from this location along Bofer Canyon Road and I-82. These impacts would continue to increase as viewers would pass the existing transmission line into an area where views of the proposed turbines would be highly prominent as viewed both to the east and west. Based on the landscape modifications introduced by the proposed wind turbines, the Project would result in high, long term impacts on views.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [a]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
7	Highway 221	Travel route, residential	5.8 miles	Level	70 degrees	Moderate	Medium	The proposed turbines would be viewed within the context of a distant existing transmission line, which has introduced a series of skylined structures along the horizon. The proposed turbines would, however, appear larger and out of scale with the features of the existing landscape. Views would be unobstructed toward the Lease Boundary. The prominence of the proposed wind turbines rising above the landscape, including the introduction of motion, would further attract attention from viewers and modify the existing landscape character. The Project would be prominent within a moderate portion of the viewshed, resulting in medium, long term impacts on views.
8	Kennewick (Canyon Lakes Area) – South and West	Residential	3.6 miles	Inferior	170 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 3.5 miles away, as a large portion of the viewshed would include moving wind turbines. Views of the Project in open, rolling hills would be unobstructed toward the west and would include an existing transmission line. Views to the southeast include the existing Nine Canyon Wind Project, which occupies a narrow portion of the landscape as viewed from this location. The series of proposed skylined wind turbines would be highly prominent in the view, resulting in high, long term impacts on views, particularly where views of multiple wind turbines would overlap and appear larger in mass.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
9	Benton City	Residential, travel route, commercial	2.7 miles	Inferior	10 to 80 degrees (based on level of screening)	Moderate	Medium	The proposed wind turbines would be intermittently screened by development within Benton City, with partial screening of the Project features occurring where the Horse Heaven Hills would partially obstruct views to the south. Where visible, there would be a limited number of turbines in view, as depicted in the visual simulation.[(b)] The presence and motion of the turbines would attract attention but would appear co-dominant with other commercial and residential developments. Other areas within the city may have more expansive, unobstructed views of the proposed wind turbines, similar to KOPs 2 and 10. The Project would expand the extent of view occupied by moving wind turbines and would be prominent from this inferior viewing angle, resulting in medium, long term impacts on views.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
10	Badger Road	Residential, travel route	1.5 miles	Inferior	150 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 1.5 miles away, as a large portion of the viewshed would include moving wind turbines. Views of the proposed wind turbines, from an inferior viewing angle, would be partially screened by topography and intermittently screened by development. Movement associated with the turbine blades would be highly visible, particularly where only the blades would visible, repeatedly rising over the hills. Based on the level of contrast introduced by the proposed wind turbines, which are much larger in scale than existing modifications in view, the Project would result in high, long term impacts on views.
11	Highland/ Finley Area	Residential	2.0 miles	Inferior	100 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 2 miles away, as a large portion of the viewshed would include moving wind turbines. Views of the Project on the Horse Heaven Hills would be unobstructed, with views toward the southwest including residential and agricultural development, as well as the existing Nine Canyon Wind Project, which occupies a moderate portion of the landscape as viewed from this location. The series of proposed skylined wind turbines would be highly prominent in the view, resulting in high, long term impacts on views, particularly where views of multiple wind turbines would overlap and appear larger in mass.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
12	County Well Road	Residential, travel route	2.5 miles	Level	100 degrees	Moderate	Medium	The proposed turbines would be viewed in the context of an existing transmission line, which has already modified the existing setting, including the introduction of distinct, vertical lines. Due to the proximity of the proposed turbines (approximately 2.5 miles), the introduction of movement into the landscape, and the extent of view occupied by these structures, the Project would attract attention and begin to dominate views from this location. In consideration of the existing modifications in view, the Project would result in medium, long term impacts on views from this location. These impacts would continue to increase as viewers would pass the existing transmission line into an area where views of the proposed wind turbines would be prominent.
13	Travis Road South of Sellards Road	Residential, travel route	1.1 miles	Level	150 degrees	Strong	High	The proposed turbines would dominate views from this location, approximately 1 mile away, as a large portion of the viewshed would include moving wind turbines. Views of the Project in open, rolling hills would be unobstructed within a mostly intact existing landscape. The series of proposed skylined wind turbines would be highly prominent in the view, resulting in high, long term impacts on views, particularly where views of multiple wind turbines would overlap and appear larger in mass.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
14	South of Benton City	Residential	1.7 miles	Inferior	90 degrees	Strong	High	Compared to KOP 9, views toward the Lease Boundary from this portion of Benton City are mostly unobstructed. The proposed turbines would dominate views from this location, approximately 1.7 miles away, as a large portion of the viewshed would include moving wind turbines. Views of the proposed wind turbines, from an inferior viewing angle, would be partially screened by topography, including turbines that are visible to the southeast. Movement associated with the turbine blades would be highly visible, particularly where only the blades would be visible, repeatedly rising over the hills. Based on the level of contrast introduced by the proposed wind turbines, which are much larger in scale than existing modifications in view, the Project would result in high, long term impacts on views.
15	I-82	Travel route	0.7 miles	Inferior	180 degrees	Strong	High	The proposed turbines would dominate views from this location, less than 1 mile away, as views to the east, north, and west would include moving wind turbines. Views of the Project in open, rolling hills would be unobstructed within a landscape modified by the presence of the interstate highway and a communication tower. The prominence of the proposed wind turbines rising above the landscape, including additional motion introduced by the turbine blades, would further attract attention from viewers and dominate the existing landscape character, resulting in high, long term impacts on views from these locations.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
16	U.S. Highway 730 – Wallula Gap	Travel route	5.0 miles	Inferior	0 degrees	None	Negligible	The proposed turbines would be screened by topography as viewed from this location, approximately 5 miles away. Based on this level of screening, Project elements would not be visually evident from this location.
N/A	Dispersed residences located 0.5 miles from proposed turbines (foreground views)	Residential	Less than 0.5 miles	Level	Up to 300 degrees	Strong	High	The proposed turbines would dominate views from dispersed residences located within the foreground distance zone (includes views from participating and non-participating properties). These views would be most impacted where views of the existing Nine Canyon Wind Project, and existing transmission lines would be screened, with the proposed turbines dominating a viewshed with limited existing modifications. The prominence of the proposed wind turbines rising above the landscape, including additional motion introduced by the turbine blades, would further attract attention from viewers and dominate the existing landscape character, resulting in high, long term impacts on views from these locations. Viewers located on participating properties may have less visual sensitivity to modifications introduced by the Project, compared to viewers located on non-participating properties, but the level of visual contrast and Project dominance would remain the same.

Table 4.10-9 Key Observation Point/Viewpoint Impact Table – Turbine Option 1

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
N/A	Horse Heaven Hills Recreation Area	Recreation	0.8 miles	Superior, level, and inferior	Up to 140 degrees	Strong	High	Views from the Horse Heaven Hills Recreation Area vary based on location, with elevated views represented by KOP 3, located on Chandler Butte, to inferior views occurring below the ridgeline and similar to KOPs 9 and 10. In general, views from this recreation area would be highly impacted where the Project would modify a large portion of the viewshed through the introduction of moving wind turbines. While hiking on trails below the ridge but within the recreation area, views may be partially screened by topography where visitors would only see the moving turbine blades repeatedly rising over the ridgeline, as described for KOP 10. Viewers along the ridgeline trail would be located directly adjacent to the proposed turbines, where views would be strongly altered by the Project. The series of proposed wind turbines would be highly prominent in the view, resulting in high, long term impacts on views from Chandler Butte, below the ridgeline trails, and from the ridgeline trail.

Notes:
(a) For more information associated with each KOP location, refer to Table 3.10-2.
(b) Horse Heaven Wind Farm, LLC 2022
I-82 = Interstate 82; KOP = key observation point; N/A = not appliable; NWR = National Wildlife Refuge

Shadow Flicker

The windPRO program predicted that shadow flicker impacts would be greatest at locations nearest to the turbines. The shadow flicker impact area for Turbine Option 1 is shown in **Figure 4.10-9**. **Table 4.10-10** presents the windPRO-predicted shadow flicker impacts for the receptors with the greatest (maximum) predicted impacts. The predicted shadow flicker impacts for all 742 receptors for both turbine option layouts are presented in the ASC (Horse Heaven Wind Farm, LLC 2021b).

Table 4.10-10: windPRO Maximum Expected Shadow Flicker Impacts for Turbine Option 1

Receptor ID	Participation Status[(a)]	UTM Coordinates (meters)		Expected Shadow Flicker in Hours per Year (h:mm)
		Easting	Northing	
177	Participant	310436.37	5114156.19	55:07
214	Participant	317662.95	5111107.33	51:55
176	Participant	310274.46	5113505.54	38:12
223	Participant	315253.07	5110907.42	30:34
141	Participant	310040.91	5112851.79	27:43
222	Participant	315230.93	5110885.00	24:23

Source: Horse Heaven Wind Farm, LLC 2021b
Note:
(a) Participant = participating landowners, with whom the Applicant has lease agreements
h:mm = hours and minutes per year; ID = identification number; UTM = Universal Transverse Mercator

The maximum predicted shadow flicker impact at a single receptor is 55 hours and 7 minutes per year (Receptor ID 177) for Turbine Option 1. This highest predicted shadow flicker impact is approximately 1.3 percent of the potential available daylight hours in any given year at the Project location. Four receptors were predicted to experience more than the industry standard threshold of 30 hours of shadow flicker per year (Receptor IDs 176, 177, 214, and 223). All four receptors have been identified as Project participants.

From a health impact perspective, Epilepsy Action (the working name for the British Epilepsy Foundation) states that while some people are sensitive to flicker rates of 3 hertz (Hz; or flashes per second) or higher, large turbines rotate at a rate that is unlikely to trigger seizures (Epilepsy Action 2022). The Project's maximum turbine blade pass frequency would be approximately 0.79 Hz (i.e., less than one alternation per second) (Horse Heaven Wind Farm, LLC 2021b); therefore, no negative health impacts on individuals with photosensitive epilepsy are anticipated.

The analysis conducted by the Applicant was deliberately conservative, and actual shadow flicker is expected to occur for less than the modeled durations. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight, and it does not account for trees or other obstructions that may block sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker impact times (Horse Heaven Wind Farm, LLC. 2021b). Based on these results, shadow flicker during operation under Turbine Option 1 would result in medium, long term, probable, confined impacts on receptors that have been identified as Project participants.

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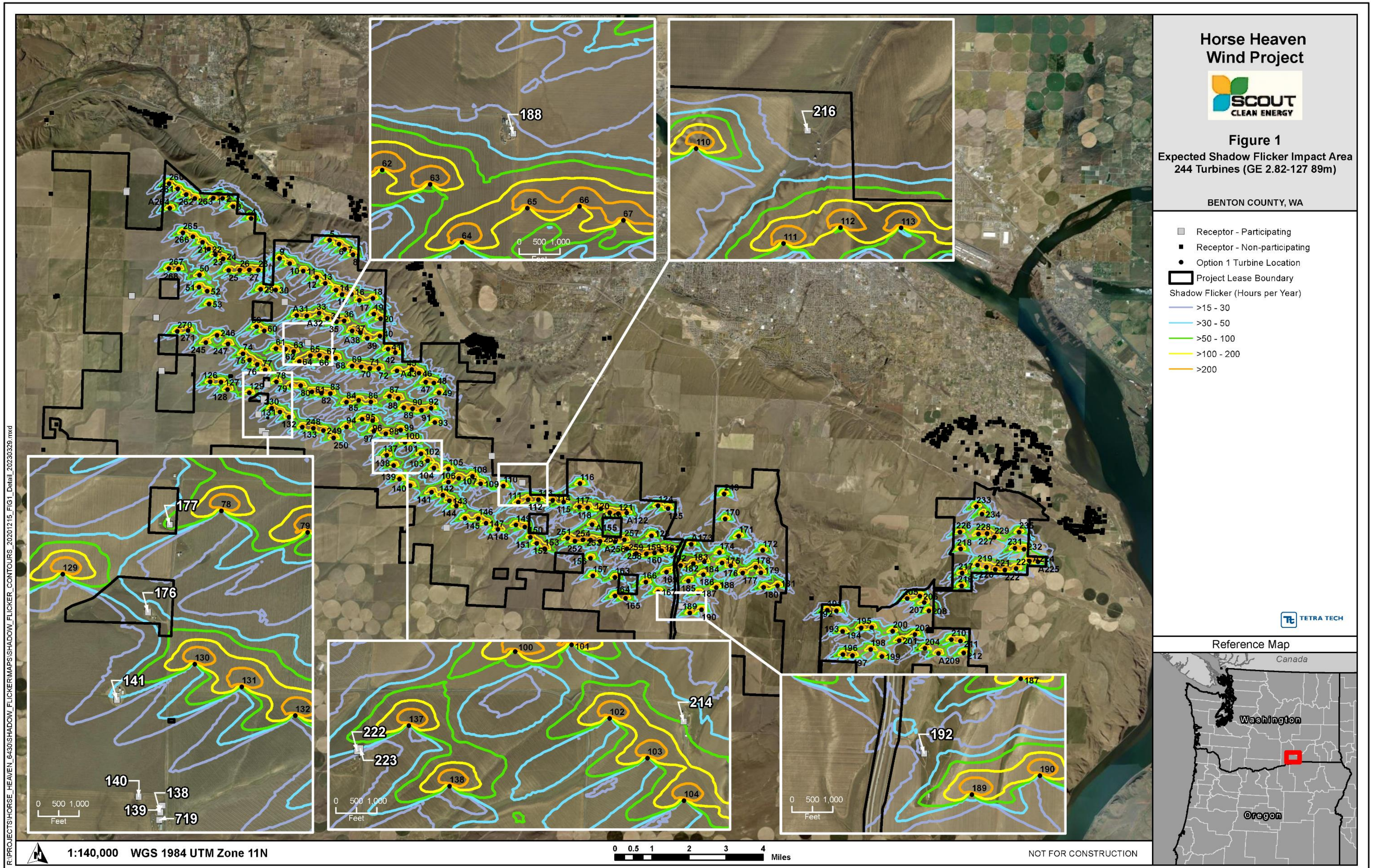

Source: Horse Heaven Wind Farm, LLC 2023a

Figure 4.10-9: Expected Shadow Flicker Impact Area Turbine Option 1 (GE 2.82-127 89m)

Light

Aviation lighting of a single red flashing light would be mounted on turbine nacelles per FAA requirements for turbines with a maximum blade tip height of 499 feet (FAA 2020). The Applicant is anticipating lighting approximately 86 percent (or up to 210 of the 244 turbines) based on the most recent turbine layout (Kobus 2022). This is subject to change. Additionally, up to four permanent meteorological towers would also be lighted as specified by the FAA. These lights would be most visible at night, akin to lighted communication towers common to the area. While visible in the distance, these lights would not measurably increase light received at neighboring receptors. Over such a large area, the addition of 210 lights is not expected to cause light trespass, nor add to sky glow. Additionally, recently passed state legislation requires that new wind turbine project apply with the FAA to have Aircraft Detection Lighting Systems (ADLS) installed that would turn of tower lighting when aircraft are not in the area of the Project (HB 1173, 2023).

Lighting from operations under Turbine Option 1 would not result in a safety hazard, and impacts would be low, long term, unavoidable, and local.

Turbine Option 2

Visual Aspects

The Project, under Turbine Option 2, would have high impacts on landscape character, similar to those under Turbine Option 1. Turbine Option 2 would introduce fewer structures into the setting, which would result in less visual clutter; however, due to the greater impacts of the increased height of the structures under Turbine Option 2, the overall effects would be similar. The additional height of the turbines under Turbine Option 2 would be more prominent near the Horse Heaven Hills ridgeline or adjacent to existing landscape modifications, where the increased vertical forms would be most evident.

Table 4.10-11 describes the impacts on views from the KOPs and other viewing locations associated with Turbine Option 2. In summary, activities during operation of Turbine Option 2 would result in areas of high, long-term, unavoidable, regional impacts on visual resources..

Table 4.10-11. Key Observation Point/Viewpoint Impact Table – Turbine Option 2

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
1	McNary NWR	Recreation	5.8 miles	Inferior	80 degrees	Moderate	Medium	Impacts would be similar to Option 1, except the taller turbines would be more prominent as viewed on the ridgeline. There would be fewer turbines in view, resulting in a less cluttered appearance, but since the proposed turbines would be larger in scale (and even larger as compared to the existing Nine Canyon Wind Project), the Project would result in medium, long term impacts on views.
2	S Clodfelter Road – East, Central, and West	Residential	3.5 miles	Inferior	200 degrees	Strong	High	Impacts would be similar to Option 1 except the taller turbines would be more prominent as viewed on the ridgeline. There would be fewer turbines in view, resulting in a less cluttered appearance, particularly where views of multiple wind turbines would overlap and appear larger in mass. Since the proposed turbines would be larger in scale (and even larger as compared to the existing Nine Canyon Wind Project), the effects of a less cluttered view would be counterbalanced, resulting in high, long term impacts on views.
3	Chandler Butte	Recreation	2.8 miles	Superior	50 degrees	Strong	High	Impacts would be similar to Option 1, except the taller turbines would be more prominent across the landscape. There would be fewer turbines in view, resulting in a less cluttered appearance, particularly where views of multiple wind turbines would overlap and appear larger in mass. Since the proposed turbines would be larger in scale (and even larger as compared to the existing Nine Canyon Wind Project), the effects of a less cluttered view would be counterbalanced, resulting in high, long term impacts on views.

Table 4.10-11. Key Observation Point/Viewpoint Impact Table – Turbine Option 2

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
4	I-82 South	Travel route	7.3 miles	Inferior	100 degrees	Moderate	Medium	Impacts would be similar to Option 1 except the taller turbines would result in fewer turbines within view. The presence of fewer turbines would produce a less cluttered appearance, particularly where views of multiple wind turbines would overlap and appear larger in mass. Since the proposed turbines would be larger in scale (and even larger as compared to the existing Nine Canyon Wind Project), the effects of a less cluttered appearance would be counterbalanced, resulting in medium, long term impacts on views.
5	Badger Mountain	Recreation	4.7 miles	Level	150 degrees	Strong	High	Impacts would be similar to Option 1, except the taller turbines would be more prominent as viewed on the ridgeline. There would be fewer turbines in view, resulting in a less cluttered appearance, particularly where views of multiple wind turbines would overlap and appear larger in mass. The relative scale of the turbines proposed for Option 2, compared to Option 1, would be apparent as views include residential and agricultural development, providing a source of scale comparison.
6	Bofer Canyon Road/I-82	Travel route	1.8 miles	Level	120 degrees	Strong	High	Impacts would be similar to Option 1 but slightly increased in magnitude. The taller turbines proposed under this option would be apparent due to the existing transmission line providing a source of scale comparison, and most of the turbines proposed adjacent to this viewpoint would occur regardless of the option selected.

Table 4.10-11. Key Observation Point/Viewpoint Impact Table – Turbine Option 2

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
7	Highway 221	Travel route, residential	5.8 miles	Level	70 degrees	Moderate	Medium	Impacts would be similar to Option 1 except the taller turbines would be more prominent as viewed from the highway. There would be fewer turbines in view, resulting in a less cluttered appearance, but since the proposed turbines would be larger in scale (and even larger as compared to the existing transmission line in view), the Project would result in medium, long term impacts on views.
8	Kennewick (Canyon Lakes Area) – South and West	Residential	5.4 miles	Inferior	170 degrees	Moderate	Medium	Impacts on views would be reduced under Option 2, as the closest proposed wind turbine would be1.8 miles further away compared to Option 1 (approximately 3.6 miles). There would also be fewer turbines in view, resulting in a less cluttered appearance. However, since the proposed turbines would be larger in scale (and even larger as compared to the existing Nine Canyon Wind Project), the Project would result in medium, long term impacts on views.
9	Benton City	Residential, travel route, commercial	2.7 miles	Inferior	10 to 80 degrees (based on level of screening)	Moderate	Medium	Impacts would be similar to Option 1 but slightly increased in magnitude. The taller turbines proposed under this option would be more prominent, and most of the turbines proposed adjacent to this viewpoint would occur regardless of the option selected.
10	Badger Road	Residential, travel route	1.5 miles	Inferior	150 degrees	Strong	High	Impacts would be similar to Option 1 except the taller turbines would be more prominent as viewed from this area. There would be fewer turbines in view, resulting in a less cluttered appearance, but since the proposed turbines would be larger in scale, (and even larger as compared to the existing modifications in view), the Project would result in high, long term impacts on views.

Table 4.10-11. Key Observation Point/Viewpoint Impact Table – Turbine Option 2

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
11	Highland/ Finley Area	Residential	2.5 miles	Inferior	100 degrees	Strong	High	Impacts would be similar to Option 1, except the taller turbines would be more prominent as viewed on the ridgeline. There would be fewer turbines in view, resulting in a less cluttered appearance, particularly where views of multiple wind turbines would overlap and appear larger in mass. Since the proposed turbines would be larger in scale (and even larger as compared to the existing Nine Canyon Wind Project), the effects of a less cluttered appearance would be counterbalanced, resulting in high, long term impacts on views.
12	County Well Road	Residential, travel route	2.5 miles	Level	100 degrees	Moderate	Medium	Impacts would be similar to Option 1 but slightly increased in magnitude. The taller turbines proposed under this option would be apparent due to the existing transmission line that provides a source of scale comparison.
13	Travis Road South of Sellards Road	Residential, travel route	1.1 miles	Level	150 degrees	Strong	High	Impacts would be similar to Option 1 but slightly increased in magnitude. The taller turbines proposed under this option would be apparent due to the existing development in view, which provides a source of scale comparison.
14	South of Benton City	Residential	1.7 miles	Inferior	90 degrees	Strong	High	Impacts would be similar to Option 1 but slightly increased in magnitude. The taller turbines proposed under this option would be more prominent, and most of the turbines proposed adjacent to this viewpoint would occur regardless of the option selected.
15	I-82	Travel route	0.7 miles	Inferior	180 degrees	Strong	High	Impacts would be similar to Option 1 but slightly increased in magnitude. The taller turbines proposed under this option would be apparent due to the existing communication tower in view, which provides a source of scale comparison.

Table 4.10-11. Key Observation Point/Viewpoint Impact Table – Turbine Option 2

KOP # [a]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Approx. Extent of Horizontal View Occupied by Project	Level of Visual Contrast	Magnitude of Impact	Impact Description
16	U.S. Highway 730 – Wallula Gap	Travel route	5.0 miles	Inferior	0 degrees	None	Negligible	The proposed turbines would be screened by topography as viewed from this location approximately 5 miles away. Based on this level of screening, Project elements would not be visually evident from this location.
N/A	Dispersed residences located 0.5 miles from proposed turbines (foreground views)	Residential	Less than 0.5 miles	Level	Up to 300 degrees	Strong	High	Impacts would be similar to Option 1 except the taller turbines would be more prominent as viewed from these residences. There would be fewer turbines in view, resulting in a less cluttered appearance. Since the proposed turbines would be larger in scale, the Project impacts would be most apparent where the existing Nine Canyon Wind Project or transmission lines are visible and provide a source of scale comparison. The Project would result in high, long term impacts on views.
N/A	Horse Heaven Hills Recreation Area	Recreation	0.8 miles	Inferior	Up to 140 degrees	Strong	High	Impacts would be similar to Option 1 except the taller turbines would be more prominent as viewed from this recreation area. There would be fewer turbines in view, resulting in a less cluttered appearance. However, since the proposed turbines would be larger in scale (and even larger as compared to the existing modifications in view), the Project would result in high, long term impacts on views.

Note:
[a] For more information associated with each KOP location, refer to Table 3.10-2.
KOP = key observation point; I-82 = Interstate 82; N/A = not applicable; NWR = National Wildlife Refuge

Shadow Flicker

The windPRO program predicted that shadow flicker impacts would be greatest at locations nearest to the turbines. The shadow flicker impact areas for Turbine Option 2 are presented in **Figure 4.10-10**. **Table 4.10-12** presents the windPRO-predicted shadow flicker impacts for the receptors with the greatest predicted impacts. The predicted shadow flicker impact for all 742 receptors for both turbine option layouts are presented in the ASC (Horse Heaven Wind Farm, LLC 2021b).

Table 4.10-12: windPRO Maximum Expected Shadow Flicker Impacts for Turbine Option 2

Receptor ID	Participation Status[(a)]	UTM Coordinates (meters)		Expected Shadow Flicker in Hours Per Year (h:mm)
		Easting	Northing	
214	Participant	317662.95	5111107.33	60:38
192	Participant	328441.37	5104524.33	33:42
176	Participant	310274.46	5113505.54	26:52
188	Participant	312194.94	5115957.61	24:38
177	Participant	310436.37	5114156.19	22:36

Source: Horse Heaven Wind Farm, LLC 2021b
[(a)] Participant = participating landowners, with whom the Applicant has lease agreements
h:mm = hours and minutes per year; ID = identification number; UTM = Universal Transverse Mercator

The maximum predicted shadow flicker impact at a single receptor is 60 hours and 38 minutes per year (Receptor ID 214). This highest predicted shadow flicker impact is approximately 1.4 percent of the potential available daylight hours in any given year at the Project location. Two receptors were predicted to experience more than the industry standard threshold of 30 hours of shadow flicker per year (Receptor IDs 192 and 214). Both have been identified as Project participants.

The Project's maximum turbine blade pass frequency would be approximately 0.79 Hz (i.e., less than one alternation per second), similar to Turbine Option 1. No negative health impacts on individuals with photosensitive epilepsy are anticipated.

Similar to Turbine Option 1, visual effects from shadow flicker during operation of Turbine Option 2 would result in medium, long term, probable, confined impacts on receptors that have been identified as Project participants.

Light

Similar to Turbine Option 1, lighting from Turbine Option 2 operations would not result in a safety hazard or other significant adverse impact, though the design would be different. Option 2 consists of higher turbines, which require two red flashing lights to be affixed to the nacelle, positioned on opposite sides (FAA 2020). These lights would be affixed to all of the turbines under Turbine Option 2 (Kobus 2022). In summary, these light impacts would be low, long term, unavoidable, and local.

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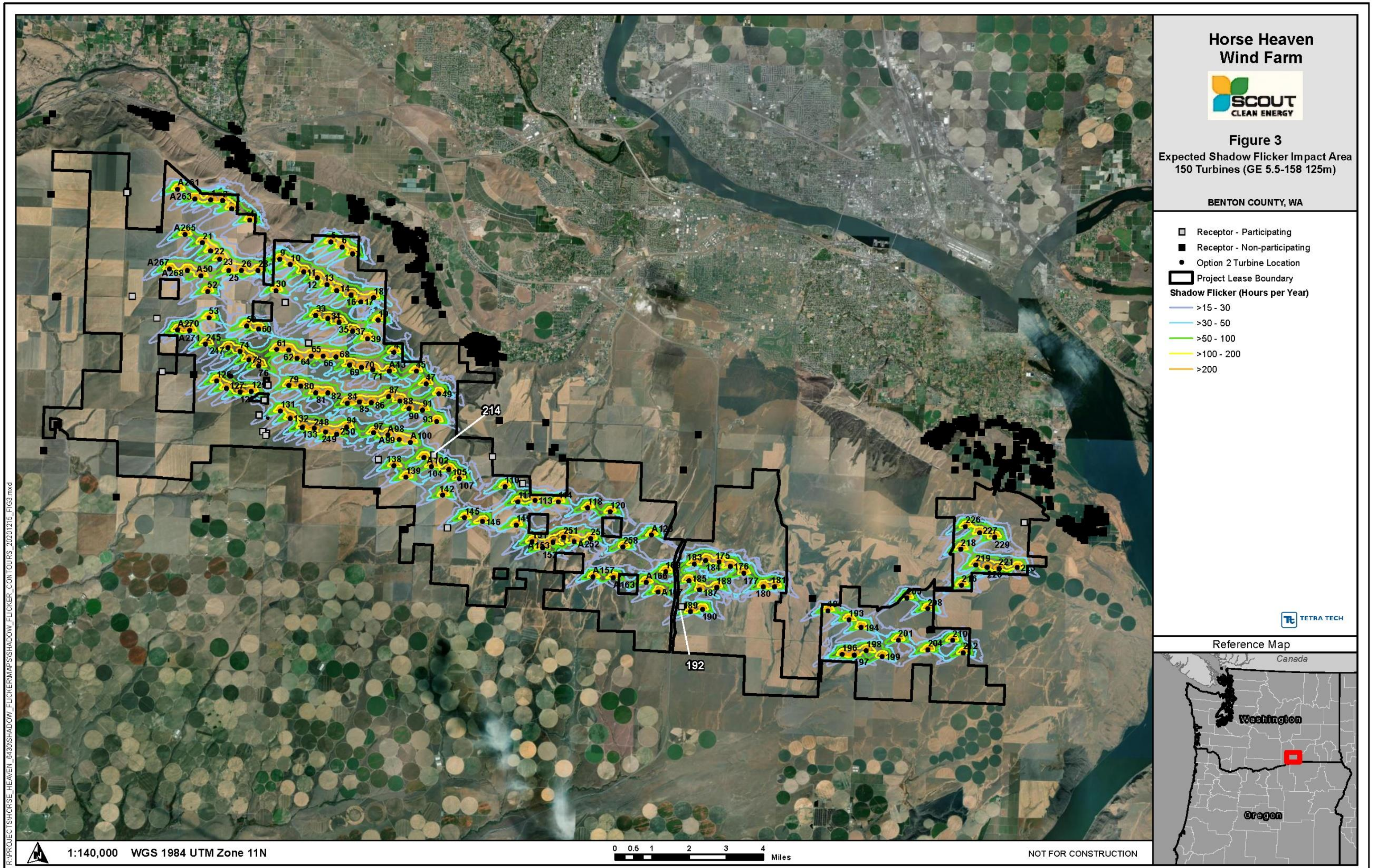

Source: Horse Heaven Wind Farm, LLC 2021b

Figure 4.10-10: Expected Shadow Flicker Impact Area Turbine Option 2 (GE 5.5-158 125m)

Solar Arrays

Visual Aspects

The Project would introduce forms, lines, colors, and textures associated with the solar arrays that are inconsistent with the existing landscape character. The conversion of existing agricultural lands to large expanses of photovoltaic panels would result in visual contrast with their flat, geometric forms and dark, slightly reflective surfaces, which are not common in the setting. The addition of the repetitive, vertical upright features associated with the solar trackers and additional fenced land would be noticeable in this rolling, panoramic landscape.

The Project would be visually prominent in the setting, resulting in medium to high impacts on landscape character. Based on the viewshed analysis presented in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022), the County Well Road and Sellards Road siting areas would be the most visible options (see Figures 5 and 6 in **Appendix 3.10-2** of this EIS). These two Solar Siting Areas would affect a larger portion of the landscape than the other solar array siting option—45 percent for County Well Road and 51 percent for Sellards Road—within the 5-mile-wide area of analysis. The Solar Siting Areas would also be located in an area with a more intact existing landscape than the Bofer Canyon siting area, resulting in more intense impacts on landscape character. The Bofer Canyon option is located near the existing Nine Canyon Wind Project, which has introduced large-scale energy infrastructure into the landscape. The viewshed analysis found that 31 percent of the area within the 5-mile-wide area of analysis would be affected by the solar arrays within the Bofer Canyon siting area (see Figure 7 in **Appendix 3.10-2** of this EIS).

Table 4.10-13 describes the impacts on views from the KOPs and other viewing locations associated with the three Solar Siting Areas. In summary, activities during operation of any of the three solar array options would generally result in medium, long-term, unavoidable, regional impacts on visual resources based on the KOP locations identified for Project analysis. The County Well Road and Bofer Canyon siting areas, would also result in high, long term, unavoidable, local impacts as viewed from limited KOP locations, which would have views of stronger visual contrast introduced by the Project resulting in higher magnitude impacts (see **Table 4.10-13**).

Table 4.10-13: Key Observation Point/Viewpoint Impact Table – Solar Array

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Level of Visual Contrast[(b)]	Magnitude of Impact			Impact Description
						County Well Road Siting Area	Sellards Road Siting Area	Bofer Canyon Siting Area	
1	McNary NWR	Recreation	Not visible	Inferior	None	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
2	S Clodfelter Road – East, Central, and West	Residential	Not visible	Inferior	None	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
3	Chandler Butte	Recreation	2.1 miles	Superior	Moderate	Medium	Negligible	Negligible	Views of the County Well Road option would be unobstructed, with the Project being prominent and beginning to dominate views from this area. The contrast between the darker solar arrays and the tan/green grasses would be evident from this elevated viewing area approximately 2 miles away, resulting in medium, long term impacts on views.
4	I-82 South	Travel route	6.0 miles	Level	Moderate	Negligible	Negligible	Medium	The Bofer Canyon option would be prominent in view and would modify the existing landscape through the introduction of dark, geometric solar arrays in a rolling landscape comprising golden, tan grasses. The impacts on these views would incrementally increase as motorists drive on I-82 between this location and KOP 6 (approximately 10 miles), with some views of the solar arrays being intermittently screened by topography. From this location, the Project would result in medium, long term impacts on views.

Table 4.10-13: Key Observation Point/Viewpoint Impact Table – Solar Array

KOP # (a)	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Level of Visual Contrast(b)	Magnitude of Impact			Impact Description
						County Well Road Siting Area	Sellards Road Siting Area	Bofer Canyon Siting Area	
5	Badger Mountain	Recreation	Not visible	Level	None	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
6	Bofer Canyon Road/I-82	Travel route	0.6 mile	Level	Strong	Negligible	Negligible	High	The Bofer Canyon option would be visually dominant and demand attention within the setting as the solar arrays would be located on both sides of I-82. An existing transmission line has modified the existing landscape, including the introduction of strong vertical lines. The contrast between the dark solar arrays and the tan grasses would be highly evident. In consideration of the existing modifications in view, the Project would result in medium, long-term impacts on views from this location. These impacts would continue to increase as viewers would pass the existing transmission line into an area where views of the solar arrays would be highly prominent as viewed both to the east and west resulting in high, long term local impacts.

Table 4.10-13: Key Observation Point/Viewpoint Impact Table – Solar Array

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Level of Visual Contrast[(b)]	Magnitude of Impact			Impact Description
						County Well Road Siting Area	Sellards Road Siting Area	Bofer Canyon Siting Area	
7	Highway 221	Travel route, residential	3.1 miles	Level	Weak	Low	Low	Negligible	The County Well Road and Sellards Road options would attract some attention but would be visually subordinate in the setting. The low form of the solar arrays would blend with the existing landscape from this distance (approximately 3 to 4 miles) and would be partially screened by topography and existing structures. The Project would result in low, long term impacts on views.
8	Kennewick (Canyon Lakes Area) – South and West	Residential	5.9 miles	Inferior	Slight	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
9	Benton City	Residential, travel route, commercial	3.9 miles	Inferior	Slight	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
10	Badger Road	Residential, travel route	6.4 miles	Inferior	Slight	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
11	Highland/ Finley Area	Residential	8.5 miles	Inferior	Slight	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.

Table 4.10-13: Key Observation Point/Viewpoint Impact Table – Solar Array

KOP # (a)	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Level of Visual Contrast(b)	Magnitude of Impact			Impact Description
						County Well Road Siting Area	Sellards Road Siting Area	Bofer Canyon Siting Area	
12	County Well Road(c)	Residential, travel route	0.2 miles	Level	Strong	High	Negligible	Negligible	The County Well Road option would be prominent in the view and would modify the existing landscape through the introduction of dark, geometric solar arrays in a flat to rolling landscape comprising tan-colored agricultural fields. An existing transmission line has already modified the landscape, including the introduction of strong vertical lines and geometric forms. In consideration of the existing modifications in view, the Project would result in medium, long-term impacts on views from this location. These impacts would continue to increase as viewers would pass the existing transmission line into an area where views of the solar arrays would be highly prominent, resulting in high, long-term, local impacts.

Table 4.10-13: Key Observation Point/Viewpoint Impact Table – Solar Array

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Level of Visual Contrast[(b)]	Magnitude of Impact			Impact Description
						County Well Road Siting Area	Sellards Road Siting Area	Bofer Canyon Siting Area	
13	Travis Road South of Sellards Road	Residential, travel route	1.0 mile	Level	Moderate	Negligible	Medium	Negligible	The Sellards Road option would be prominent in the view and would modify the existing landscape through the introduction of dark, geometric solar arrays in a rolling landscape comprising tan-colored agricultural fields (note: visual simulation in the 2022 ASC does not include these views to the west). The views from this area are generally intact, with views of the Project occurring away from the direction of travel along the road. Views of the Project would therefore be short in duration. In consideration of view duration and partial screening by existing topography, the Project would result in medium, long term impacts on views from this location.
14	South of Benton City	Residential	3.2 miles	Inferior	None	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.

Table 4.10-13: Key Observation Point/Viewpoint Impact Table – Solar Array

KOP # [(a)]	Viewer Name	Viewer Type	Distance to Project	Viewer Position	Level of Visual Contrast[(b)]	Magnitude of Impact			Impact Description
						County Well Road Siting Area	Sellards Road Siting Area	Bofer Canyon Siting Area	
15	I-82	Travel route	0.1 mile	Level	Strong	Negligible	Negligible	High	The Bofer Canyon option would be visually dominant and demand attention within the setting, as the solar arrays would be located on both sides of the interstate. (Note: visual simulation in Appendix 3.10-2 does not include these views to the east, south, or west). The interstate highway, distribution power line, and communication tower have modified the existing landscape, including the introduction of vertical and curving lines, but the overall composition of the landscape is visually intact. Views of the solar arrays, with their geometric form, would be highly prominent both to the east and west, resulting in high, long term local impacts as described under KOP 6.
16	U.S. Highway 730 – Wallula Gap	Travel route	Not visible	Inferior	None	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.
N/A	Horse Heaven Hills Recreation Area	Recreation	Not visible	Inferior	Slight	Negligible	Negligible	Negligible	Project elements associated with the three Solar Siting Areas would not be visually evident.

Notes:

(a) For more information associated with each KOP location, refer to Table 3.10-2.

(b) Level of visual contrast indicated here refers to the Solar Siting Area(s) where a low, medium, or high magnitude of impact was identified in subsequent columns. For alternatives where a "negligible" magnitude of impacts was identified, the solar arrays would not be readily seen from those KOP locations.

(c) Views from dispersed residences within the foreground distance zone (0 to 0.5 miles) were analyzed from KOP 12.

ASC = Application for Site Certification; KOP = key observation point; N/A = not applicable; NWR = National Wildlife Refuge

Light

Once constructed, external lighting supporting the solar arrays would be limited to security lighting. Security lighting would be directed downward and shielded to avoid nighttime sky glow and light trespass effects. This type of exterior lighting would be consistent with other similar sources of light in the area such as the existing Bonneville Power Administration substation and rural residential development, as well as the adjacent Nine Canyon Wind Farm facility.

Light levels during Project operation are anticipated to increase by a minor amount. Typical new Leadership in Energy and Environmental Design (LEED) certified building exterior lighting can account for a vertical and horizontal illuminance value no greater than 0.1 lux (15.1 as a sky glow reading) at the property boundary. A recent study completed for the U.S. Department of Energy found that the luminescence of light-emitting diode (LED) streetlights can increase sky glow 0.2 to 1.6 times the baseline sky glow for nearby receptors (DOE 2017). Assuming a conservative existing conditions classification of E2, the increase in sky glow of this magnitude would not be expected to change the ELZ classification from E2 to E3.

This suggests that Project-related lighting would introduce a minor change to the existing level of sky glow. The ELZs for all light receptors are predicted to remain within their current classifications and would not change as a result of Project operation. As such, lighting from the Project during operations would be a minor contributor to light levels and is not anticipated to change the overall existing light environment during nighttime viewing. In summary, the impacts from lighting would be low, long term, unavoidable, and local.

Glare

The preliminary Project layout for the solar arrays was modeled using GlareGauge to evaluate the potential extent of glare the Project may cause for receptors at several KOPs and segmented traffic routes representing proximal areas surrounding the Project.

To better analyze the potential for glare as a result of sunlight reflectance from the Project and accommodate GlareGauge conservative assumptions noted in the Glare Analysis Report, 60 solar array areas were modeled within the Project layout, which was broken down into three separate areas: Solar Array County Well (West 1), Solar Array Sellards (West 2), and Solar Array Bofer Canyon (East) (Horse Heaven Wind Farm, LLC 2021b). These three areas are presented in **Figures 4.10-11, 4.10-12, and 4.10-13**, respectively. Eight separate glare analyses (i.e., Analysis 1 through Analysis 8) were performed to provide a quantitative assessment of the potential for glare as a result of the Project, based on views from first- and second-story structures, and commuter and commercial vehicles (Horse Heaven Wind Farm, LLC 2021b).

Based on the SGHAT results, all of the modeled receptors (KOPs and vehicular routes) are predicted to not experience glare as a result of the Project. As previously noted, the GlareGauge model does not account for varying ambient conditions (e.g., cloudy days, precipitation), atmospheric attenuation, screening due to existing topography not located within the defined array layouts, or existing vegetation or structures (including fences or walls), nor does the tool allow proposed landscaping to be included; therefore, the predicted results are considered to be conservative.

As noted in Section 3.10, the FAA has developed the following criteria for analysis of solar energy projects located on jurisdictional airports (78 Federal Register 63276):

1) No potential for glint or glare in the existing or planned air traffic control tower cab; and

2) No potential for glare or “low potential for after-image” along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan.

Based on the results of the FAA Notice Criteria Tool, the Project would not exceed notice criteria, so a formal filing is not necessary, and the impacts from glare would be low, long term, unavoidable, and confined.

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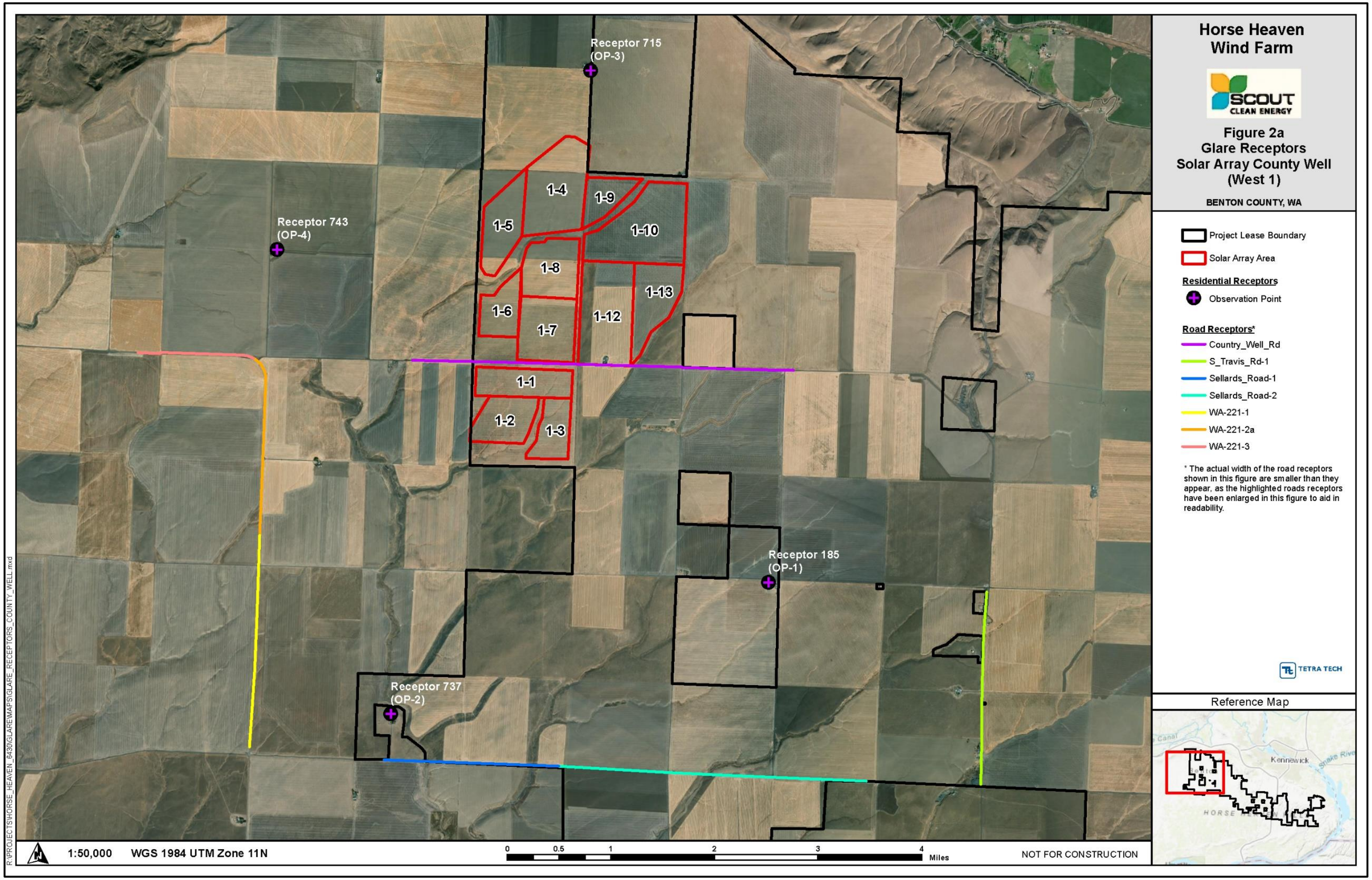
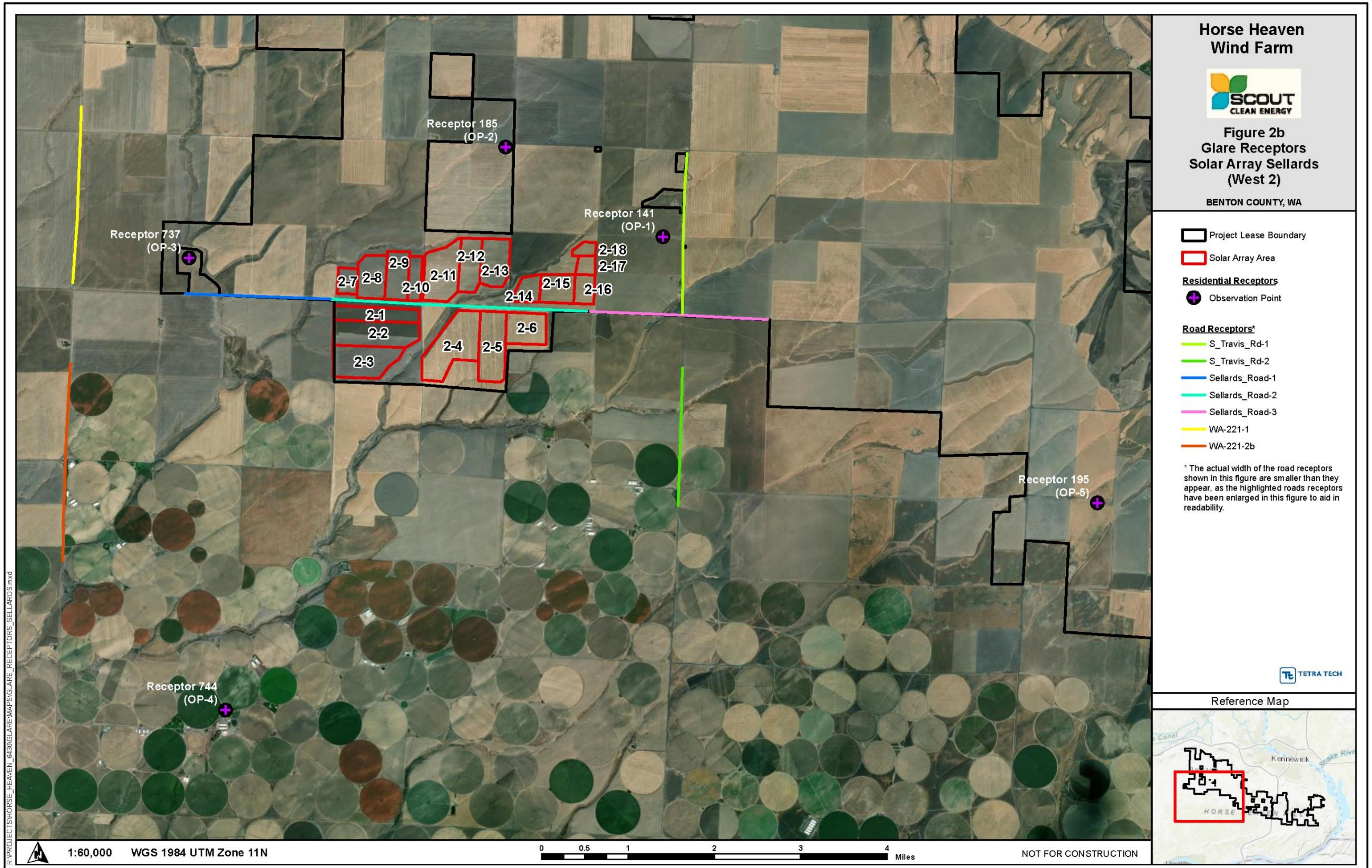


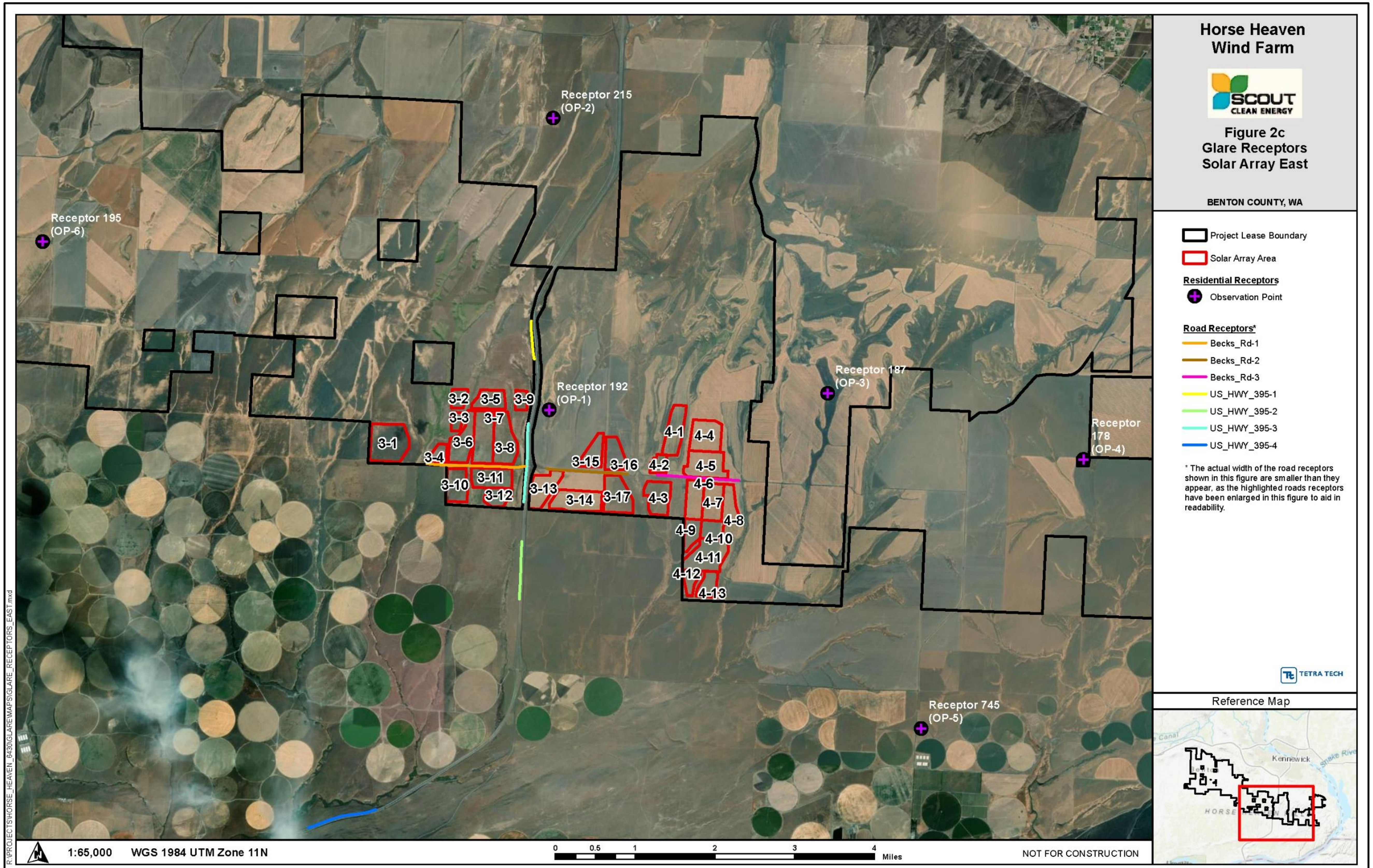
Source: Horse Heaven Wind Farm, LLC 2021b

Figure 4.10-11: Glare Receptors Solar Array County Well (West 1)



Source: Horse Heaven Wind Farm, LLC 2021b

Figure 4.10-12: Glare Receptors Solar Array Sellards (West 2)



Source: Horse Heaven Wind Farm, LLC 2021b

Figure 4.10-13: Glare Receptors Solar Array East

Battery Energy Storage Systems

Visual Aspects

Each BESS would introduce a flat, rectangular, geometric form associated with its proposed yard, similar to the proposed substations, with equipment contained in geometric shipping containers (stacked up to 40 feet tall). These features would contrast with the existing rolling agrarian landscape character as their flat-topped geometric form and close grouping (adjacent to the Project substations) would be inconsistent with adjacent agricultural structures.

In general, the BESS would not attract attention from most locations within the area of analysis. The introduction of the BESS into views from KOPs 6 and 12, which have already been modified by an existing transmission line, would result in long-term, medium impacts on views from 1.2 miles and 0.5 miles away, respectively. The geometric form of the BESS, including the vertically stacked rectangular containers, would attract attention but would be co-dominant with the existing modifications. Views from KOPs 3, 4, and 7 would be minimally modified by the BESS as views would occur from approximately 2.7 to 7.3 miles away, where the Project would mostly blend with the existing landscape setting. The geometric form of the BESS from these three KOPs would appear in scale with the existing landscape from these more distant viewpoints.

The BESS would not be visible from KOPs 1, 2, 5, 8, 9, 10, 11, 13, 14, 15, or 16, or the Horse Heaven Hills Recreation Area; therefore, these Project components would have no impact on these views (see **Appendix 3.10-2**). Overall, activities during operation of the BESS would result in medium, long-term, unavoidable, local impacts on visual resources.

Light

BESS would have security lighting similar to the solar arrays and would have similar impacts—low, long term, unavoidable, and local.

Substations and Transmission Lines

Visual Aspects

The substations would introduce a flat, rectangular, geometric form associated with the substation yard and tall, vertical, geometrical substation equipment. These industrial features would contrast with the existing rolling agrarian landscape character. Where located adjacent to existing transmission lines or substations, the proposed elements would be in scale and consistent with the landscape setting, but in areas where there are limited existing utilities, the substations would alter the landscape setting and would be visually prominent.

In general, the substations would not attract attention from most locations within the area of analysis. The introduction of the substations into views from KOPs 6 and 12, which have been modified by an existing transmission line, would result in long-term, medium impacts on views from 1.2 and 0.5 miles away, respectively. The geometric form of the proposed substation yard and vertical structures would attract attention but would be co-dominant with the existing modifications in the landscape. Views from KOPs 3, 4, and 7 would be minimally modified by the substations as views would occur from approximately 2.7 to 7.3 miles away, where the Project would mostly blend with the existing setting. The geometric form of the substation and vertical protrusions would appear in scale with the existing landscape from these more distant viewpoints.

The substations would not be visible from KOPs 1, 2, 5, 8, 9, 10, 11, 13, 14, 15, or 16 or the Horse Heaven Hills Recreation Area; therefore, this Project component would have no impacts on these views (see **Appendix 3.10-2**).

The transmission lines would modify the existing landscape character through the introduction of repeating vertical transmission line structures, associated linear access roads, and associated vegetation clearing. These effects would be most apparent where there are no adjacent existing transmission lines or other vertical protrusions (e.g., communication towers, substations, etc.) and would result in long-term impacts on landscape character.

Impacts on viewers from the transmission lines would vary from high to low. The highest impacts would occur on the views from four KOP locations (KOPs 6, 12, 13, and 15) located within 2 miles of the transmission lines. Views from KOP 6 have been modified by an existing transmission line; the introduction of the proposed transmission line would result in medium, long-term impacts from approximately 1.2 miles away. The form of the existing transmission line would be repeated by the Project (H-frame structures), reducing potential landscape clutter, and the proposed transmission line would be sited further away from KOP 6 than the existing transmission line. Therefore, the Project would attract attention but would be co-dominant with the existing modifications.

The proposed transmission line would begin to dominate views from KOP 12, where an existing transmission line crosses the road and the Project would parallel the road with a series of transmission line structures stretching to the horizon. Due to the head-on view of the proposed transmission line and its difference in design compared to the existing line, the Project would result in medium, long-term impacts at this location. Views from KOPs 13 and 15 would be highly impacted by the transmission line. From this location, there are limited existing modifications in view, with the existing landscape setting appearing mostly intact. The Project would dominate these unobstructed views through the introduction of tall transmission line structures viewed as skylined above the low, rolling terrain.

The transmission lines would not be visible from KOPs 1,5, 14, 16, or the Horse Heaven Hills Recreation Area; therefore, this Project component would have no impacts on these views. Impacts on views resulting from the introduction of the transmission lines would be low in magnitude from KOPs 2, 3, 4, 7, 8, 9, 10, and 11 due to the viewing distance (more than 2 miles away).

In summary, during operation, the transmission lines would result in areas of high, long term, unavoidable, local impacts, as well as medium, long term, unavoidable, regional impacts on visual resources. During operation, the substations would also result in medium, long term, unavoidable, regional impacts on visual resources.

Light

Substations would have security lighting similar to the solar arrays and would have similar impacts—low, long term, unavoidable, and local. No lighting for security or to satisfy FAA requirements is expected for the transmission lines.

Comprehensive Project

Visual Aspects

In consideration of the CESA methods and the Washington Energy Facility Site Evaluation Council (EFSEC) site certification process, the Project was assessed as it relates to compliance with state and local visual management requirements. The Project analysis presented in this section would comply with WAC 463-60-362(3), which establishes the requirements for a visual resource analysis as part of the site certification process. Specifically, this analysis describes the aesthetic impacts of the proposed Project, shows its location relative to physical features of the site, and outlines procedures to restore or enhance the landscape disturbed during construction (see Section 4.10.2.4 for proposed mitigation measures, and the Applicant’s 2022 ASC, including the

Revegetation and Noxious Weed Management Plan [Horse Heaven Wind Farm, LLC 2022; Appendix N] and an Initial Site Restoration Plan to be submitted to EFSEC prior to construction if the Project is approved).

The Benton County Comprehensive Plan identified a planning goal to conserve the visually prominent naturally vegetated steep slopes and elevated ridges that define the Columbia Basin landscape, which are uniquely a product of ice age floods. The planning policy further states that the County should “consider the preservation of the ridges and hillside areas through various development regulations” and “pursue a variety of means and mechanisms…to protect the natural landform and vegetative cover of the Rattlesnake uplift formation, notably Rattlesnake, Red, Candy, and Badger mountains and the Horse Heaven Hills” (Benton County 2020). Since these lands have not been placed into Open Space Conservation or other types of conservation, and there are no specific policies to protect the landscapes impacted by the Project, the Project would technically be in compliance with this aspect of the county plan. The Horse Heaven Hills and northern ridgeline would, however, become dominated by energy infrastructure, with potential long duration views from areas within the communities between Benton City and Kennewick. These impacts on views would be most intense where unobstructed views of a large number of turbines occur.

The combined impacts of the different Project components would result in a landscape character dominated by large-scale energy infrastructure, including wind turbines, solar arrays, collector lines, access roads, multiple transmission lines and substations, the O&M facility, and the BESS. The existing setting does include a smaller wind farm and two existing transmission lines, but the scale of the Project and prominence of the turbines would result in high, long-term impacts on the existing landscape.

Views from most residences and other KOP locations would primarily be impacted by the presence of the large, moving wind turbines. The turbines would attract attention and, depending on the extent of their viewshed modified by the turbines, could dominate views as described in **Tables 4.10-9 and 4.10-11**. In addition, some viewers, such as those associated with KOPs 3, 6, 12, 13, and 15, would have views of multiple Project components, introducing additional variety and visual clutter into these views as shown in the visual simulations (2022 ASC [Horse Heaven Wind Farm, LLC 2022]). Views from these locations would be dominated by energy infrastructure, as a result of the additive effects from each Project component, which would result in high, long term impacts. Since these impacts would occur on viewpoints beyond the neighboring receptors, these effects would be regional in extent. In summary, activities during operation of all components of the Project would result in high, long term, unavoidable, regional impacts on visual resources.

Shadow Flicker

The comprehensive impact of shadow flicker relates only to turbines under both turbine options. Shadow flicker during operation under both Turbine Option 1 and Turbine Option 2 would result in medium, long term, probable, confined impacts on visual receptors that have been identified as Project participants.

Light

The combined impacts of the different Project components would result from the addition of FAA lighting across the Lease Boundary and the addition of security lighting near solar arrays, substations, and BESS. The FAA-required lighting is expected to be visible outside of the Project vicinity but would not add light trespass or increase sky glow. The security lighting at the solar arrays, substations, and BESS would be directed downward and shielded to limit off-site impacts and degradation of sky glow, and the resulting impacts are expected to be similar to those of existing light sources used for agricultural or residential security lighting, which are low, long term, unavoidable, and local.

Glare

The Project components combined would result in low-glare impacts on the public and on flights to and from local airports. Glare impacts would result primarily from the solar arrays, and glare modeling analysis indicates that the surrounding observation points and vehicle routes would not experience glare as a result of the Project (Horse Heaven Wind Farm, LLC 2021b). The glare analysis also found that the Project would not create any glare effects that could impact jurisdictional airports. The predicted glare at these receptors is considered to be a conservative representation as the modeling tool does not consider conditions or obstacles between the solar arrays and the receptors, such as vegetative screening (existing or planted), buildings, topography, etc. that would minimize glare.

For the reasons described above, glare from operation of the Project would have low, long term, unavoidable, and confined impacts.

4.10.2.3 Impacts during Decommissioning

The decommissioning and removal of the Project and its components would have impacts similar to those of the construction process. The decommissioning process would result in increased motion associated with construction equipment, short term impacts from dust generation, and landform modification to more closely match preconstruction conditions. Additionally, light and glare associated with construction equipment operations would produce light and glare impacts similar to those of the construction stage. The removal of Project components would likely require additional ground disturbance and vegetation clearing, resulting in reclamation efforts similar to those conducted after the construction process was completed. The restoration of vegetation in these areas would take a number of years to fully establish, but over time the landscape impacted by the Project would begin to more closely resemble preconstruction conditions. A summary of impacts during decommissioning is provided in **Table 4.10-14c**. The following discussion presents a detailed analysis based on component and the comprehensive Project.

Turbine Option 1

Visual Aspects

Impacts during decommissioning under Turbine Option 1 would be similar to those resulting from the construction of the Project, including the movement of vehicles attracting attention. Viewers located within the foreground distance zone (0 to 0.5 miles) or in locations where views would be occupied by large portions of the Project being decommissioned, would experience increased visual contrast in these views. These impacts would be short in duration and would cease after removal of the Project is complete and vegetation has been re-established. Decommissioning activities under Turbine Option 1 would result in medium, short term, probable, local impacts on visual resources.

Light

The Proposed Action would generate minimal light during the decommissioning of Turbine Option 1 from vehicles and equipment. Decommissioning work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, lighting impacts from decommissioning under this option would be negligible, temporary, unlikely, and limited.

Glare

Similar to lighting, the Proposed Action would generate minimal glare during the decommissioning under Turbine Option 1 from vehicle and equipment windshields or glass enclosures. Therefore, glare from decommissioning under this option would have impacts that are low, temporary, feasible, and confined.

Turbine Option 2

Visual Aspects

Decommissioning under Turbine Option 2 would have impacts similar to Turbine Option 1 except that it would have fewer wind turbines, requiring fewer roads and other supporting facilities to be removed. This would result in slightly reduced visual contrast and modifications to the existing landscape introduced during Project decommissioning. Decommissioning activities under Turbine Option 2 would result in medium, short term, probable, local impacts on visual resources.

Light

The Proposed Action would generate minimal light during decommissioning under Turbine Option 2 from vehicles and equipment. Decommissioning work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, lighting impacts from decommissioning under this option would be negligible, temporary, unlikely, and limited.

Glare

Similar to lighting, the Proposed Action would generate minimal glare during decommissioning under Turbine Option 2 from vehicle and equipment windshields or glass enclosures. Therefore, glare from decommissioning is expected to have impacts that are low, temporary, feasible, and confined.

Solar Arrays

Visual Aspects

Visual impacts resulting from decommissioning of the solar arrays would be similar to construction, which would be focused within the selected Solar Siting Areas. Within the fenced boundaries, all lands would be restored to more closely match preconstruction conditions, including revegetation of the site. Decommissioning activities for the solar arrays would result in low, short term, probable, local impacts on visual resources.

Light

The Proposed Action would generate minimal light during decommissioning of the solar arrays from vehicles and equipment. Decommissioning work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, lighting impacts from decommissioning of this Project component are expected to be negligible, temporary, unlikely, and limited.

Glare

Similar to lighting, the Proposed Action would generate minimal glare during decommissioning of the solar arrays from vehicle and equipment windshields or glass enclosures. Some glare would occur for a short time after operation ends and before the panels are removed. Therefore, glare from decommissioning of this Project component is expected to have impacts that are low, temporary, feasible, and confined.

Battery Energy Storage Systems

Visual Aspects

Impacts would be similar to the construction of the Project with the removal of the BESS containers and reclamation of those sites. This would include additional motion from construction equipment and associated dust during those activities. As described for other components, vegetation restoration would occur in these disturbed areas, and the landscape would begin to more closely resemble preconstruction conditions. Decommissioning activities for the BESS would result in low, short term, probable, local impacts on visual resources.

Light

The Proposed Action would generate minimal light during the decommissioning of the BESS from vehicles and equipment. Decommissioning work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, lighting impacts from decommissioning this Project component are expected to be negligible, temporary, unlikely, and limited.

Glare

Similar to lighting, the Proposed Action would generate minimal glare during decommissioning of the BESS from vehicle and equipment windshields or glass enclosures. Therefore, glare from decommissioning is expected to have impacts that are low, temporary, feasible, and confined.

Substations and Transmission Lines

Visual Aspects

Impacts of decommissioning both the substations and transmission lines are expected to be similar to those of constructing these Project components. The removal of the tall, vertical structures associated with both components would result in additional motion from construction equipment, structure dismantling, and conductor removal. As described for other components, vegetation restoration would occur in these disturbed areas, and the landscape would begin to more closely resemble preconstruction conditions. Decommissioning activities for the substations and transmission lines would result in low, short term, probable, local impacts on visual resources.

Light

The Proposed Action would generate minimal light during decommissioning of the substations and transmission lines from vehicles and equipment. Decommissioning work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, lighting impacts from decommissioning this Project component are expected to be negligible, temporary, unlikely, and limited.

Glare

Similar to lighting, the Proposed Action would generate minimal glare during decommissioning of the substations and transmission lines from vehicle and equipment windshields or glass enclosures. Therefore, glare from decommissioning is expected to have impacts that are low, temporary, feasible, and confined.

Comprehensive Project

Visual Aspects

During Project decommissioning, there would be short term impacts from these activities, which would occupy a large portion of the landscape and include removal of wind turbines, solar arrays, the O&M facility, transmission lines, BESS, and substations, as well as the reclamation of access roads, turbine pads, and other areas disturbed during construction and operation of the Project. These activities would include views of additional vehicular traffic, as well as areas of exposed soil after the removal of vegetation and during earthwork activities, prior to site reclamation efforts. The removal of vegetation would be noticeable in the setting and would contrast with the existing character; however, over time, as vegetation is re-established in the area, it would begin to repeat vegetation patterns common in the area.

Viewpoints and KOPs located within the foreground distance zone (0 to 0.5 miles) would be most impacted by decommissioning, particularly where a large portion of their viewshed would be occupied by decommissioning multiple Project components simultaneously. Overall, activities during decommissioning of all components of the Project would result in medium, short term, probable, regional impacts on visual resources.

Light

The Proposed Action would generate minimal light during the decommissioning process from vehicles and equipment. Decommissioning work would be concentrated during daylight hours, minimizing the potential need for temporary nighttime lighting. Therefore, lighting impacts from decommissioning the Project components combined are expected to be negligible, temporary, unlikely, and limited.

Glare

Similar to lighting, the Proposed Action would generate minimal glare during the decommissioning process from vehicle and equipment windshields or glass enclosures. Sunlight on solar panels during removal would cause glare for a short time after operation ends and before panels are removed. Therefore, glare from decommissioning is expected to have impacts that are low, temporary, feasible, and confined.

4.10.2.4 Recommended Mitigation Measures

This section describes measures that would reduce or compensate for impacts related to visual aspects, light, and glare from construction, operation, and decommissioning of the Project. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

Visual Aspects Mitigation

EFSEC has identified the following additional and modified mitigation measures for the Project to avoid and/or minimize potential impacts on visual resources, adapted from BLM (2013) and CESA (2011):

- Wind turbines:
  - **VIS-1:**[50] Relocate turbines located within the foreground distance zone (0 to 0.5 miles) of non-participating residences to avoid completely dominating views from these highly sensitive viewing locations. Siting the turbines further away would reduce the level of visual contrast and prominence (CESA 2011; BLM 2013).
  - **VIS-2:** Do not place piggyback advertising, cell antennas, commercial messages, or symbols on proposed wind turbines, as these have the potential to introduce additional visual contrast and would seem out of place in this natural-appearing agricultural landscape (BLM 2013).

[50] Vis-: Identifier of numbered mitigation item for Visual Aspects

- **VIS-3:** Maintain clean nacelles and towers to avoid any spilled or leaking fluids accumulating dirt, which would contrast with the clean, white/gray wind turbines and result in increased visual contrast within the landscape (BLM 2013).

- Solar arrays:
  - **VIS-4:** Avoid complete removal of vegetation beneath solar arrays during construction, where possible, to reduce contrast between the exposed soil and adjacent undisturbed areas during Project operation. If site grading requires the removal of vegetation, the area will be revegetated and maintained during Project operation (BLM 2013).
  - **VIS-5:** Install opaque fencing to directly screen views of the solar arrays where sited within 0.5 miles of KOPs (including the alignment of I-82 and other linear KOPs) or residences. To allow the proposed fencing to blend into the setting, color-treat the fencing to minimize color contrast with the existing landscape (BLM 2013).
- Battery Energy Storage System:
  - **VIS-6:** Design BESS to blend with the adjacent agricultural character, including selecting materials and paint colors to reduce contrast with the existing setting. By mimicking design characteristics of agricultural structures in the area, the BESS facilities would appear consistent with the area's agricultural setting, including the overall visual scale of those existing structures (BLM 2013).
- Substation and transmission lines:
  - **VIS-7:** Maximize the span length across highways and other linear viewing locations to decrease visual contrast at the highway crossings. By moving the structures as far from the road as possible, the effect of those structures being located directly adjacent to these linear viewing locations would be reduced (BLM 2013).
  - **VIS-8:** Choose the type of proposed transmission structure (H-frame or monopole) to best match the adjacent transmission lines and to minimize visual clutter from the introduction of different structure types into the landscape, which would result in increased visual contrast (BLM 2013).

Application of the above mitigation measures would incrementally reduce visual contrast, but based on the scale of the Project, including the height of the proposed wind turbines, these measures would not effectively reduce identified levels of contrast or degrees of impact magnitude.

Shadow Flicker Mitigation

EFSEC has identified the following additional mitigation measure for the Project to avoid and/or minimize potential impacts from shadow flicker:

SF-1:[51] The Applicant would attempt to avoid, minimize, and mitigate shadow flicker at non-participating residences. Shadow flicker can usually be addressed by planting trees, shading windows, operational programming, or other mitigation measures. As a last resort, the control system of the wind turbine could

[51] SF-: Identifier of numbered mitigation item for Shadow Flicker

be programmed to stop the blades during the brief periods when conditions result in a perceptible shadow flicker.

SF-2: The Applicant would set up a complaint resolution procedure that would include the following: 1) A 24-hour “hot line” or other form of communication that the public can use to report any undesirable shadow flicker associated with the operation of the wind turbines, with the ability to log the date and time of a complaint. This line of communication would be maintained for at least one year, at which time it could be reassessed to continue or be terminated; 2) An attempt to contact the complainant within 24 hours; and 3) A requirement to report any complaints and their resolution to EFSEC during monthly reports to the Council.

Light Mitigation

EFSEC has identified the following additional mitigation measure for the Project to avoid and/or minimize potential impacts from light:

LIG-1:[52] The Project would be constructed with LEED-certified building exterior(s) and security lighting to minimize vertical and horizontal illuminance to keep the lighting on site and to reduce impacts at the Lease Boundary and beyond.

Glare Mitigation

There are no recommended mitigation measures proposed for glare.

4.10.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant’s proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant’s proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant’s proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant’s Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023b). This regulation requires applicants to submit “application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings.” A more detailed discussion of the proposed changes is provided in Chapter 2.

[52] LIG-: Identifier of numbered mitigation item for Light

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[53]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to minimal changes to layout of the turbines and other Project infrastructure. This includes impacts associated with both turbine options, which, through reduction in the number of turbines, would result in fewer turbines being visible from some KOP locations. Based on the prominence and extent of proposed turbines in view, no changes in impact levels are anticipated and Significant Unavoidable Adverse Impacts on visual aspects would remain.

Through removal of the proposed transmission line located within the foreground distance zone (0 to 0.5 miles) as viewed from KOP 13, impacts on these views would be reduced to a medium level with the transmission line now being proposed approximately 2 miles away.

High impacts associated with views from I-82 (KOPs 6 and 15) of the Bofer Canyon Solar Siting Area (East Solar Array) would be reduced to a medium level based on the reduction in the size of proposed solar arrays, only occurring on the east side of I-82, which would result in the arrays being intermittently screened from view along the interstate including from both KOPs 6 and 15. Based on the post-adjudication Applicant commitments

[53] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

provided in the Final ASC, high impacts on views from I-82 would be reduced to a medium level, therefore the Bofer Canyon Solar Siting Areas would not result in Significant Unavoidable Adverse Impacts on visual resources.

The additional Applicant commitments identified above do not change the impact ratings associated with other project components previously provided for visual aspects, light and glare, and shadow flicker in the Draft EIS, and the remaining impact ratings would be the same.

4.10.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This EIS weighs the impacts on visual resources that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.10-14a, 4.10-14b, and 4.10-14c**..

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Table 4.10-14a: Summary of Potential Impacts on Visual Aspects, Light, and Glare during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Visual Aspect	Turbine Option 1 Turbine Option 2	Activities would attract attention and would modify the localized existing landscape setting.	Medium	Short Term	Probable	Local	No mitigation identified	None identified
Visual Aspect	Solar Arrays BESS Substations Transmission Lines	Activities would be seen and would attract attention in partially intact settings but would mostly be subordinate to existing landscape features.	Low	Short Term	Probable	Local	No mitigation identified	None identified
Visual Aspect	**Comprehensive Project**	Activities would attract attention and would modify the existing landscape setting. Due to the additive effect of the different Project features, these impacts would affect a larger area.	Medium	Short Term	Probable	Regional	No mitigation identified	None identified
Light	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations Transmission Lines **Comprehensive Project**	Activities would be completed mainly during daytime hours without the need for nighttime lighting.	Negligible	Temporary	Unlikely	Limited	No mitigation identified	None identified
Glare	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations Transmission Lines **Comprehensive Project**	Activities could generate glare from construction equipment or solar panels.	Low	Temporary	Feasible	Confined	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Site Evaluation Council

Table 4.10-14b: Summary of Potential Impacts on Visual Aspects, Shadow Flicker, Light, and Glare during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Visual Aspect	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	The wind turbines, and comprehensive Project, would dominate views from many KOP locations, and the landscape would appear strongly altered.	High	Long Term	Unavoidable	Regional	**VIS-1:** Relocate turbines located within the foreground distance. **VIS-2:** No advertising, cell antennas, commercial messages, or symbols placed on wind turbines. **VIS-3:** Maintain clean nacelles and towers.	Significant for Visual Aspects.
Visual Aspect	Solar Arrays (all options) Substations Transmission Lines	The solar arrays (all options), substations, and transmission lines would attract attention and would modify the existing landscape setting.	Medium	Long Term	Unavoidable	Regional	**VIS-4:** Avoid complete removal of vegetation beneath solar arrays. **VIS-5:** Install color-treated, opaque fencing to screen views of the solar arrays. **VIS-8**: Choose the type of transmission structure to best match the adjacent transmission lines.	None identified
Visual Aspect	County Well Solar Array	The County Well solar array siting area would dominate views from KOP 12 and the local landscape would appear strongly altered where there are limited existing landscape modifications.	High[(e)]	Long Term	Unavoidable	Local	**VIS-4:** Avoid complete removal of vegetation beneath solar arrays. **VIS-5:** Install color-treated, opaque fencing to screen views of the solar arrays.	None identified
Visual Aspect	Transmission Lines	The transmission lines would dominate views from KOP 15 and the landscape would appear strongly altered in this localized area where there are limited existing landscape modifications.	High	Long Term	Unavoidable	Local	**VIS-7**: Maximize the span length across highways and other linear viewing locations. **VIS-8**: Choose the type of transmission structure to best match the adjacent transmission lines.	None identified
Visual Aspect	BESS	The BESS would attract attention from some KOP locations and would modify the localized existing landscape setting.	Medium	Long Term	Unavoidable	Local	**VIS-6:** Design BESS to blend with the adjacent agricultural character.	None identified
Shadow Flicker	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Wind turbines would create shadow flicker that would impact Project participants.	Medium	Long Term	Probable	Confined	**SF-1:** The Applicant would attempt to avoid, minimize. and mitigate shadow flicker at nearby residences. **SF-2:** The Applicant would set up a complaint resolution procedure.	None identified

Table 4.10-14b: Summary of Potential Impacts on Visual Aspects, Shadow Flicker, Light, and Glare during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Light	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations Transmission Lines **Comprehensive Project**	Lighting for security purposes and to conform with FAA requirements would be visible outside the Lease Boundary but would have limited effect in terms of light trespass and sky glow degradation.	Low	Long Term	Unavoidable	Local	**LIG-1:** Use LEED-certified building exterior(s) and security lighting.	None identified
Glare	Solar Arrays **Comprehensive Project**	Solar panels at all modeled receptors and vehicular routes are predicted to not experience glare as a result of Project operations; glare would not exceed FAA notice criteria, and a formal filing is not necessary.	Low	Long Term	Unavoidable	Confined	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
(e) The analysis of the post-adjudication Applicant commitments provided in the Final ASC (Horse Heaven Wind Farm, LLC 2023b) has resulted in a change to the impact rating associated with Bofer Canyon Solar Siting Area (East Solar Array). Specifically, high impacts identified from KOPs 6 and 15 have been reduced to a medium level as described in Section 4.10.2.5 Post-Adjudication Applicant Commitments.
BESS = battery energy storage system; EFSEC = Washington Energy Site Evaluation Council; FAA = Federal Aviation Administration; KOP = key observation point; LEED = Leadership in Energy and Environmental Design

Table 4.10-14c: Summary of Potential Impacts on Visual Aspects, Light, and Glare during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Visual Aspect	Turbine Option 1 Turbine Option 2	Activities would attract attention and would modify the localized existing landscape setting.	Medium	Short Term	Probable	Local	No mitigation identified	None identified
Visual Aspect	Solar Arrays BESS Substations Transmission Lines	Activities would be seen and would attract attention in partially intact settings but would mostly be subordinate to existing landscape features.	Low	Short Term	Probable	Local	No mitigation identified	None identified
Visual Aspect	**Comprehensive Project**	Activities would attract attention and would modify the existing landscape setting. Due to the additive effect of the different Project features, these impacts would affect a larger area.	Medium	Short Term	Probable	Regional	No mitigation identified	None identified
Light	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations Transmission Lines **Comprehensive Project**	Activities would be completed mainly during daytime hours without the need for nighttime lighting.	Negligible	Temporary	Unlikely	Limited	No mitigation identified	None identified
Glare	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations Transmission Lines **Comprehensive Project**	Activities could generate glare from construction equipment or solar panels.	Low	Temporary	Feasible	Confined	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Site Evaluation Council

4.10.3 Impacts of No Action Alternative

Visual Aspects Impacts

Under the No Action Alternative, impacts related to visual resources from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

Shadow Flicker

Under the No Action Alternative, none of the sources of shadow flicker described above for operation of the Proposed Action would occur, and no alternative use would cause shadow flicker other than the operation of wind turbines.

Light

Under the No Action Alternative, none of the lighting sources described above for construction, operation, and decommissioning of the Proposed Action would occur. Current agricultural land uses could have direct impacts from heavy farm equipment operations similar to construction and decommissioning of the Proposed Action in magnitude, duration, spatial extent, and likelihood.

Glare

Under the No Action Alternative, none of the glare sources described above for construction, operation, and decommissioning of the Proposed Action would occur. Current agricultural land uses could have direct impacts from heavy farm equipment operations similar to construction and decommissioning of the Proposed Action in magnitude, duration, spatial extent, and likelihood.

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4.11 Noise and Vibration

This section evaluates the impacts of the proposed Horse Heaven Wind Farm (Project, or Proposed Action) on the levels of noise and vibration within the Project vicinity. Section 3.11 presents the affected environment for noise and vibration. The study area for this assessment includes the noise sensitive receptor (NSR) locations on adjacent properties and areas of dense population near the City of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River. These receptors most sensitive to noise typically include residences, hospitals, schools, parks, and churches.

Under the Washington State Environmental Policy Act, this Draft Environmental Impact Statement weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when determining the significance of identified potential impacts (WAC 197-11-330 and WAC 197-11-794). These impacts were qualitatively assessed based on the method of analysis described in Section 4.1. The impact rating system is summarized in **Table 4.11-1**.

Table 4.11-1: Impact Rating Table for Noise and Vibration from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

As identified in **Table 4.11-2**, the determination of impact magnitude is based on impacts relating to noise and vibration. The identified ratings have been included to further define magnitude in each case.

Table 4.11-2: Criteria for Assessing Magnitude of Impacts on Noise and Vibration

Magnitude of Impacts	Description
Negligible	**Noise:** Not audible, and no increase in ambient noise levels. The noise environment would appear unaltered by Project components and would not attract attention; **Vibration:** No noticeable vibrations resulting from Project components would be measured, observed, or perceived at neighboring receptors; and **State noise limits:** Project impacts would be below state limits at all NSR locations**.**
Low	**Noise:** Potentially audible, with an increase in noise level between 0 and 5 dBA. An increase of 3 dBA in noise level is at the threshold of human perception of noise increase and an increase of 5 dBA is an observable increase in noise level. These levels would cause no interference to outdoor or indoor environments; **Vibration:** Vibrations resulting from Project components could be measured or observed at neighboring receptors; and **State noise limits:** Project impacts would be below state limits at all NSR locations.
Medium	**Noise:** Audible, with an increase in noise level between 5 and 10 dBA. An observable increase in noise levels above the threshold of human perception. Noise level may interfere with outdoor or indoor environments; **Vibration:** Vibrations from Project components could be measured or observed at neighboring receptor's dwellings or structures; and/or **State noise limits:** Project impacts would be at or below state limits at all NSR locations.
High	**Noise:** Audible, with an increase in noise level greater than 10 dBA. An increase of 10 dBA would be considered a doubling of the perceived noise level. Noise level would likely cause interference with outdoor and indoor environments; **Vibration:** Vibrations from Project components could be measured or observed at neighboring receptors at levels causing annoyance and/or the potential to cause structural damage to buildings or other structures; and/or **State noise limits:** Project impacts would exceed state limits at NSR locations.

dBA = A-weighted decibels; NSR = noise sensitive receptor

Background

Potential impacts from the Proposed Action are assessed for noise and vibration during the construction, operation, and decommissioning stages of the following Project components:

- Turbine Option 1 and Turbine Option 2
- Solar Arrays
- Substations
- Battery Energy Storage Systems (BESS)
- Comprehensive Project

The evaluation presented herein relies on the noise modeling and calculations of construction and operation presented in the 2022 Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2022). For the assessment of noise impacts from Project development, this analysis includes a review of the following:

- Construction calculations presented in the 2022 ASC

- Construction noise calculations and operation noise modeling prepared by Horse Heaven Wind Farm, LLC (Applicant) (Appendix O, Horse Heaven Wind Farm, LLC 2022)
- Supplemental emission calculations of noise impacts presented in this section

4.11.1 Method of Analysis

Anticipated noise impacts during construction and operation of the Project were quantified using sound attenuation over distance using hemispherical spreading for construction and an environmental sound propagation program (model) for operation. Hemispherical spreading describes the decrease in level when a sound wave propagates away from a source uniformly in all directions above ground. Noise impacts during construction were assumed to be representative of potential noise impacts during decommissioning. Vibration impacts were qualified using standard screening distances from construction equipment operation for both the construction and the decommissioning stages.

Construction Methodology

Construction of the Project is expected to be typical of other similar projects in terms of the schedule, equipment used, and construction activities such as land clearing, concrete work, and building. Construction activities would occur primarily during daytime hours within a typical construction work week (Monday through Saturday). Equipment would include cranes, land-clearing equipment, and earth-moving equipment. The noise level would vary during the construction period, depending on the construction stage. For this analysis, it was conservatively assumed that all potential construction equipment would be operating continuously at the closest location to an NSR. To calculate the changes in noise level in this scenario, the noise levels from all construction equipment were totaled and then the inverse square law was utilized. The inverse square law is a property in physics whereby an energy such as sound pressure (noise) varies with the distance from the source inversely as the square of the distance. Using this law, the noise level decreases by 6 A-weighted decibels (dBA) for each doubling of distance from the sound point source.

Ground-borne vibration generated by construction equipment typically diminishes rapidly with distance from the vibration source. Federal Transit Administration (FTA) screening distances from construction activities of 100 feet for highly vibration-sensitive buildings (e.g., hospitals with vibration-sensitive equipment) and 50 feet for residential uses and historic buildings were used to determine vibration impacts (FTA 2018).

Operation Methodology

Operation of the Project is expected to be typical of other similar projects. Noise models of the proposed turbine options were developed by Tetra Tech for the 2022 ASC and revised in a technical memorandum; the most impactful scenarios are addressed in this section (Appendix O, Horse Heaven Wind Farm, LLC 2022).

Noise impacts resulting from the Project were evaluated using the most recent version of CadnaA (Computer Aided Noise Abatement; DataKustik GmbH 2020), an environmental noise propagation computer program that was developed to assist with noise propagation calculations for major noise sources and projects. For this analysis, the major noise outdoor sources modeled are associated with Turbine Option 1 and Turbine Option 2. The major noise sources were wind turbines, solar arrays, substations, and BESS. The sources were modeled using an expected operational usage factor of 100 percent. Usage factor accounts for the fraction of time that the equipment is in use over the specified time period. This is a conservative assumption as there are different operational cycles whereby some equipment will be operating while other equipment will be shut down and represents the maximum noise level that can be generated by the operational scenarios. **Appendix 4.11-1** describes the model inputs and lists the configuration of the calculation parameters used to complete noise modeling for the Project.

Wind Turbines

Sound generated by an operating turbine comprises both aerodynamic and mechanical sound, with the dominant sound component from modern utility-scale turbines being largely aerodynamic. Aerodynamic sound refers to the sound produced from air flow and the interaction with the turbine tower structure and moving rotor blades. Mechanical sound is generated by the gearbox, generator, and cooling fan and is radiated from the surfaces of the nacelle and machinery enclosure and by openings in the nacelle casing. Recent improvements in the design of turbine mechanical components and the use of improved noise-dampening materials have minimized mechanical noise emissions. Sound reduction elements in turbine design include impact noise insulation of the gearbox and generator, sound-reduced gearbox, sound-reduced nacelle, and rotor blades designed to minimize noise generation.

Wind energy facilities, in comparison to other energy-related facilities, are unique in that the sound generated by each individual turbine will increase as the wind speed across the site increases. Turbine sound is negligible when the rotor is at rest, increases as the rotor tip speed increases, and is generally constant once rated power output and maximum rotational speed are achieved. Under this condition, the maximum sound power level for turbines under the Project's Turbine Option 1 and Turbine Option 2 would be reached at approximately 15.7 to 22.4 miles per hour (7 to 10 meters per second), according to the manufacturer specifications (Horse Heaven Wind Farm, LLC 2022). It is important to recognize that, as wind speeds increase, the background ambient sound level will generally increase as well, resulting in acoustic masking effects; however, this trend is also affected by local contributing sound sources. Therefore, during periods of elevated wind speed when higher turbine sound emissions occur, the sound produced from a turbine operating at maximum rotational speed may be somewhat masked due to wind-generated sound. In practical terms, this means that as turbine noise increases with increased rotational speed, so does the baseline noise environment in the area of the turbine. The ambient noise survey conducted for the Project confirms that, in general, the baseline noise levels in the study area increase as wind speeds increase (see Section 3.11, Table 3.11-4 of this EIS; March 2022 Baseline Sound Survey Report; Appendix O, Horse Heaven Wind Farm, LLC 2022). Conversely, these acoustic masking effects may be limited during periods of unusually high wind shear (i.e., change in wind direction or speed) or at receiver locations that are sheltered from the prevailing wind direction.

The maximum number of turbines and maximum turbine height carried forward for analysis as components of the Project under Turbine Option 1 and Turbine Option 2 are summarized in **Table 4.11-3**. For the purposes of this study, the loudest turbine model was used for each of the turbine options.

Table 4.11-3: Proposed Action Wind Turbine Layout and Model Options

Turbine Parameters/Features	Turbine Option 1	Turbine Option 2
Wind Turbine Output	GE 2.82-MW	GE 5.5-MW
Wind Turbine Layout	244 turbines up to a maximum blade tip height of 499 feet[(a)]	150 turbines up to a maximum blade tip height of 671 feet[(a)]
Tower Type	Tubular	Tubular
Turbine Rotor Diameter	417 feet	518 feet
Turbine Hub Height (ground to nacelle)	292 feet	411 feet
Tower Base Diameter	15.1 feet	15.1 feet
Maximum Rated Sound Power Level (dBA)[(b)]	110.0	107.5
Confidence Interval (k-factor)[(c)]	2 dBA	2 dBA

Source: Horse Heaven Wind Farm, LLC 2022
Notes:
(a) As proposed in the 2022 ASC, Table 2.3-1
(b) As presented in the 2022 ASC, Table 4.1.1-7
(c) As presented in the 2022 ASC, Section 4.1.1.2
ASC = Application for Site Certification; dBA = A-weighted decibels; GE = General Electric; MW = megawatts

Turbine Option 1 is shown in **Figure 4.11-1**, and Turbine Option 2 is shown in **Figure 4.11-2**. The final number of turbines and the specific model used would depend on availability and other considerations at the time of construction. However, the number of turbines would not exceed 244, and the maximum turbine height (ground to blade tip) would not exceed 671 feet. The 2022 ASC noise assessment was based on two potential layout options with two potential turbine models per layout option.

The acoustic modeling analysis and compliance assessment presented in the 2022 ASC assumed that all turbines were operating simultaneously and continuously at maximum rated power, when in reality it is more likely that turbines would often be operating at lower wind speeds, thus producing lower sound emissions. Therefore, while ambient sound levels might be lower at lower wind speeds, so would the turbine sound emissions. **Table 4.11-4** shows the sound power level by wind speed for each turbine under consideration (Horse Heaven Wind Farm, LLC 2022).

Table 4.11-4: Wind Turbine Sound Power Levels (dBA) Correlated with Wind Speed

Turbine	Wind Turbine Maximum Sound Power Level at Reference Wind Speed (meters per second / miles per hour)									
	3/6.7	4/8.9	5/11.2	6/13.4	7/15.7	8/17.9	9/20.1	10/22.4	11/24.6	12/26.8
Option 1 Layout-GE 2.82	-	96.7	96.9	100.4	103.9	106.8	109.2	110.0	110.0	110.0
Option 2 Layout-GE 5.5	-	93.8	94.5	97.6	101.0	104.0	106.4	107.5	107.5	107.5

Source: Horse Heaven Wind Farm, LLC 2021a
dBA = A-weighted decibels

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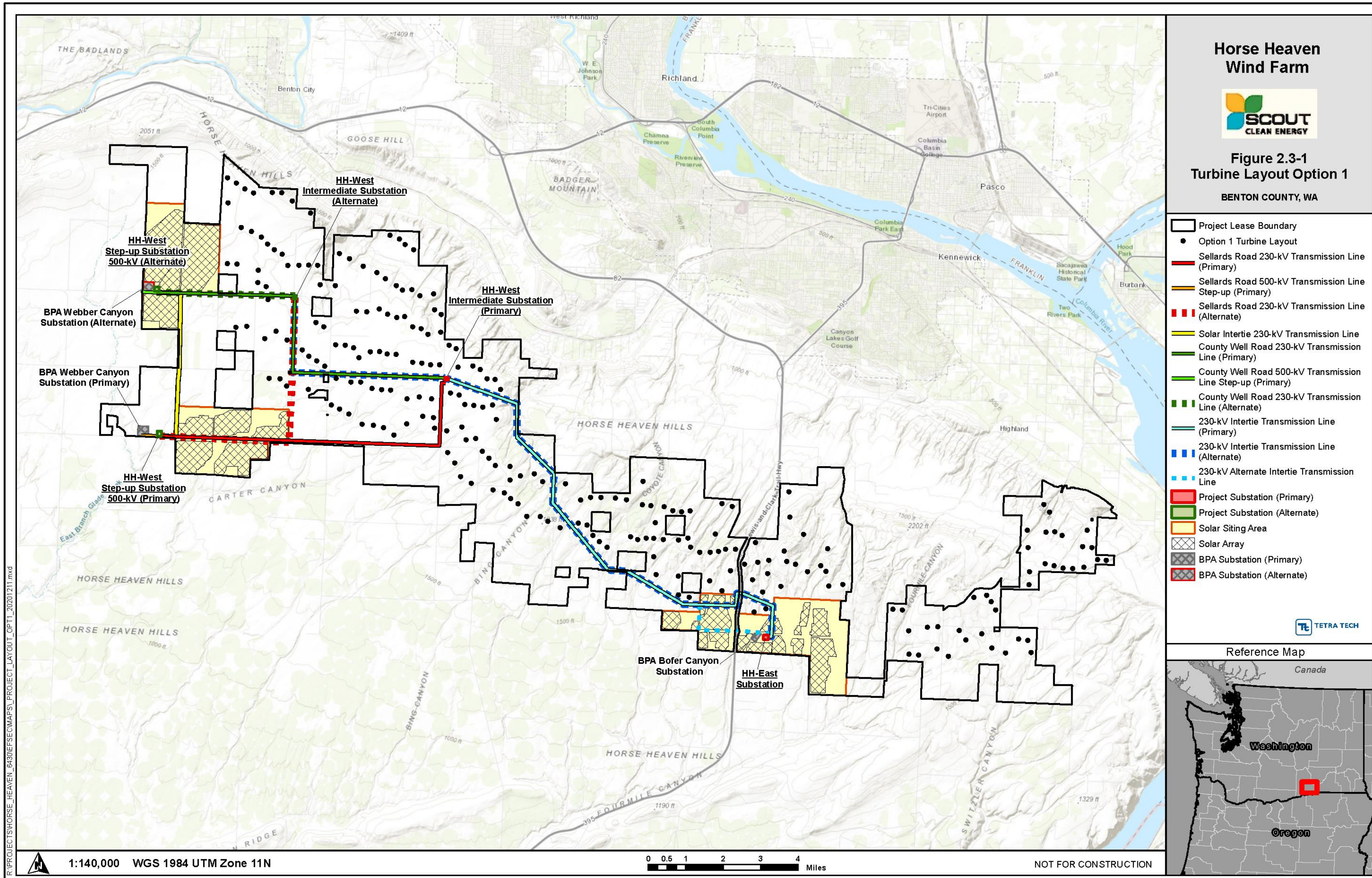
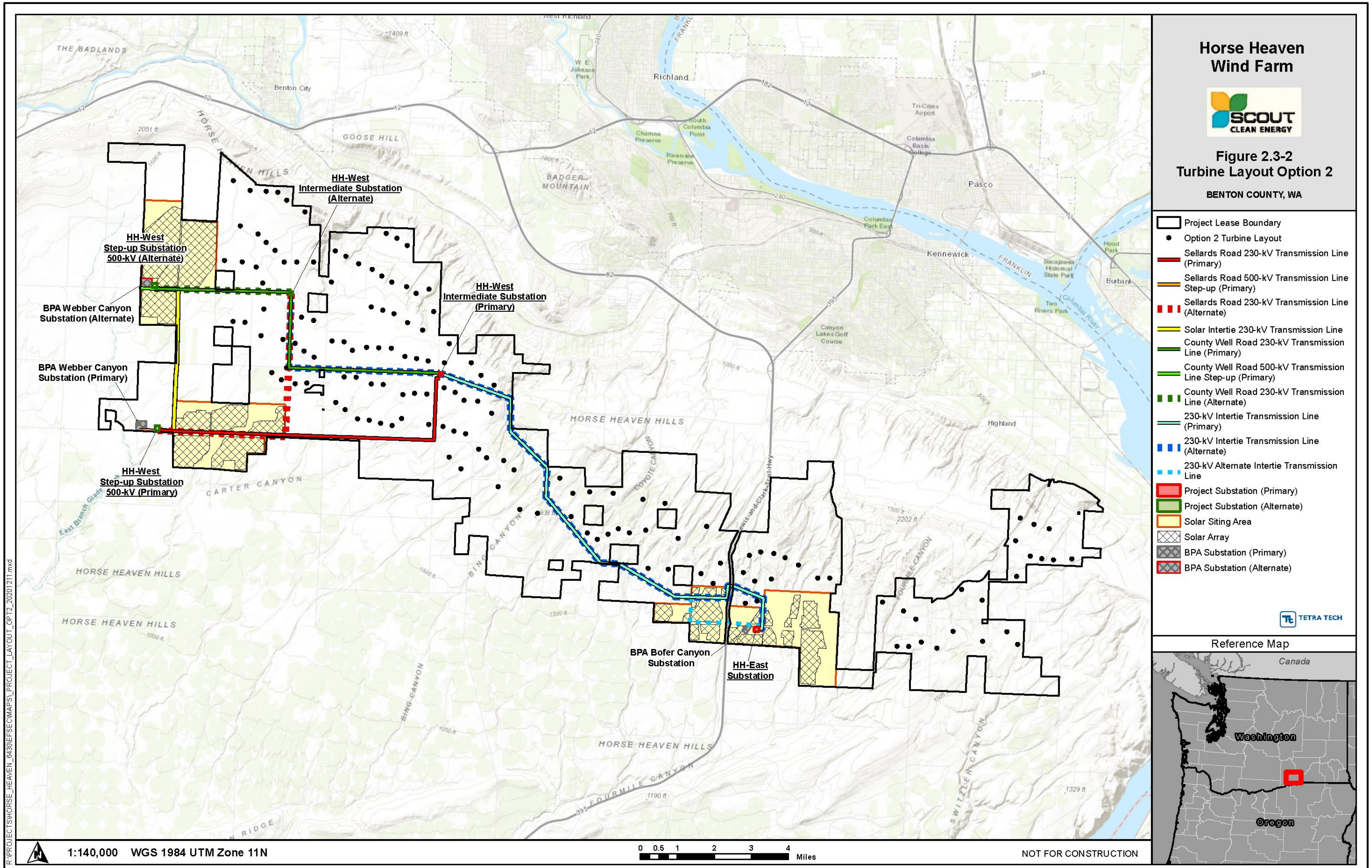


Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.11-1: Turbine Option 1 Layout



Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.11-2: Turbine Option 2 Layout

Solar Arrays

The major components of the proposed solar energy generation systems are the solar modules, tracking systems, posts, and related electrical equipment (e.g., inverters and transformers). Inverters serve the function of converting direct current to alternating current in accordance with electrical regulatory requirements. The alternating current electricity from the inverters would be routed to transformers that would increase the output voltage from the inverter (660 volts per individual unit) to the collection system voltage (34.5 kilovolts [kV]). The transformers may be co-located with the inverters or may be centrally located within the solar array. Transformers at these locations would step up the voltage from the inverters. Sound emissions would be associated with the transformers and inverters. Electronic noise from inverters can be audible but is often reduced by a combination of shielding, noise cancelation, filtering, and noise suppression.

The Project's general arrangement was reviewed and directly imported into the acoustic model so that on-site equipment could be easily identified, buildings and structures could be added, and sound emission data could be assigned to sources as appropriate. The primary noise sources during operation of the solar arrays are the inverters and transformers.

Reference sound power levels input to CadnaA 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 noise levels are based on Applicant-supplied sound power level data for the major sources of equipment. **Table 4.11-5** summarizes the equipment sound power level data used as inputs to the initial modeling analysis.

Table 4.11-5: Modeled Octave Band Sound Power Level (dB) for Solar Equipment

Equipment	Sound Power Level for Octave Band Frequency (Hz)									Broadband (dBA)
	31.5	63	125	250	500	1,000	2,000	4,000	8,000	
Inverter/Transformer Block[(a)]	75	83	90	91	90	87	82	75	68	96

Source: Horse Heaven Wind Farm, LLC 2021a
Note:
(a) Revised sound power input levels table, November 2021
dB = decibels; dBA = A-weighted decibels; Hz = hertz

Battery Energy Storage Systems

Two BESS may be developed for the Project[54]. The BESS would be capable of storing, and later deploying, up to 150 megawatts (MW) of energy each generated by the Project using lithium-ion batteries. Each BESS would use a series of self-contained systems. For the impact analysis, the BESS were assumed to be placed adjacent to the three substations.

It is expected that all equipment associated with the BESS could operate 24 hours per day. Reference sound power levels input to CadnaA 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

[54] The Applicant provided three locations for consideration of constructing the two BESS. An analysis for all the components and distinct parts as presented in Table 2.1-1 of the ASC has been completed where enough information was provided to do so.

are based on estimated sound power levels that are generally deemed to be conservative, as they are based on louder measurements or assumptions that would generate a higher sound level. The projected operational BESS noise levels are associated with storage container cooling equipment and are based on Applicant-supplied sound power level data for the major sources of equipment (Horse Heaven Wind Farm, LLC 2022). **Table 4.11-6** summarizes the equipment sound power level data used as inputs to the initial modeling analysis.

Table 4.11-6: Modeled Octave Band Sound Power Level for Battery Energy Storage System

Equipment	Octave Band Sound Power Level (dB) by Frequency (Hz)									Broadband (dBA)
	31.5	63	125	250	500	1,000	2,000	4,000	8,000	
Single BESS[a]	54	64	71	77	80	79	78	73	64	85
Total BESS (50 Containers	71	81	88	94	97	96	95	90	81	102

Source: Horse Heaven Wind Farm, LLC 2021a
Note:
[a] BESS sound power is given per container. The modeling assumed 50 containers per storage area.
BESS = battery energy storage system; dB = decibels; dBA = A-weighted decibels; Hz = hertz

Substations

The primary ongoing noise sources at substations are the transformers, which generate sound generally described as a low humming. There are three main sound sources associated with a transformer: core noise, load noise, and noise generated by the operation of the cooling equipment. The core vibrational noise is the principal noise source and does not vary significantly with electrical load.

Transformer noise varies with transformer dimensions, voltage rating, and design and attenuates with distance. The noise produced by substation transformers is primarily caused by the load current in the transformer's conducting coils (or windings), and, consequently, the main frequency of this sound is twice the supply frequency (60 hertz [Hz]). The characteristic humming sound of transformers consists of tonal components generated at harmonics of 120 Hz. Most of the acoustical energy resides in the fundamental tone (120 Hz) and the first three or four harmonics (240, 360, 480, and 600 Hz).

Circuit-breaker operation may also cause audible noise, particularly the operation of air-blast breakers, which is characterized as an impulsive sound event of very short duration and expected to occur no more than a few times throughout the year. Because of its short duration and infrequent occurrence, circuit-breaker noise was not considered in this analysis.

The Project would include up to five on-site locations where substations could be sited to support the wind and solar facilities, which were incorporated into the acoustic modeling analysis. Substation transformer broadband sound source levels were derived based on their given specifications and/or transformers used at similar facilities. Transformer sound source data by octave band center frequency were calculated based on the estimated transformer National Electrical Manufacturers Association rating using standardized engineering guidelines (NEMA 2019). **Table 4.11-7** lists the five substations, the number of transformers planned for installation at each substation, and the transformer megavolt ampere ratings. Sound source level details cannot be disclosed because that information is considered proprietary to the transformer manufacturers.

Table 4.11-7: Modeled Octave Band Sound Power Level for Substation Transformers

Substation	Trans-former MVA Rating	Number of Trans-formers	Octave Band Sound Power Level (dB) by Frequency (Hz)									Broad-band (dBA)
			31.5	63	125	250	500	1,000	2,000	4,000	8,000	
HH-East Substation	120	1	58	78	90	92	98	95	91	86	77	101
	250	1	71	91	103	105	111	108	104	99	90	113
	192	1	66	86	98	100	106	103	99	94	85	109
	137	1	64	84	96	98	104	101	97	92	83	107
HH-West (34.5 to 230 kV; 250 MW Wind)	230[(a)]	1	100	106	108	103	103	97	92	87	80	104
	147	1	64	84	96	98	104	101	97	92	83	107
HH-West (34.5 to 230 kV; 250 MW Solar)	120	1	58	78	90	92	98	95	91	86	77	101
	192	1	66	86	98	100	106	103	99	94	85	109
HH-West (230 to 500 kV) - Sellards Road	187	4 (max 3 running at once)	66	86	98	100	106	103	99	94	85	109
HH-West (230 to 500 kV) - County Well Road	187	4 (max 3 running at once)	66	86	98	100	106	103	99	94	85	109
HH-West (230 to 500 kV) - County Well Road ALTERNATE1	230[(a)]	2	100	106	108	103	103	97	92	87	80	104

Source: Horse Heaven Wind Farm, LLC 2021a
Note:
[(a)] Calculated using Method 2, Table 4.5 Sound Power Levels of Transformers, Electric Power Plant Environmental Noise Guide. (Bolt, et al, 1984)
dB = decibels; dBA = A-weighted decibels; Hz = hertz; kV = kilovolts; max = maximum; MVA = megavolt amperes; MW = megawatts

Transmission Lines

One of the electrical effects of high-voltage transmission lines is corona. Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware attributable to very high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and the production of ozone. Corona noise is generally a principal concern with transmission lines of 345 kV and greater during foul weather. Corona noise is also generally associated with foul weather conditions. Because the Project design voltage is 230 kV, no corona-related noise issues are anticipated, and any related impacts would be negligible and temporary during foul weather events.

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC

(Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on noise and vibration are discussed in Section 2.1.3 and summarized below.

Construction and Decommissioning

Because construction equipment operates intermittently and the types of machines that would be used at the Project site would change with the stage of construction, noise emitted during construction would be mobile and highly variable, making it challenging to control. The construction management protocols would include the following best management practices and noise mitigation measures to minimize noise 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, will 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 that the engine's housing doors are kept closed, and install noise-insulating material mounted on the engine housing consistent with manufacturers' guidelines, if possible.
- Limit possible evening shift work to low-noise activities such as welding, wire pulling, and other similar activities, together with appropriate material handling equipment.
- Utilize a complaint resolution procedure to address any noise complaints received from residents.

Operation

Modeling results indicated that under Turbine Option 2, Project operation would be in compliance with the WAC 173-60 regulatory requirements at NSRs and the Lease Boundary; therefore, no noise mitigation measures are needed for operation under Turbine Option 2. The following mitigation measures are proposed for operation under Turbine Option 1.

- Manufacturer-provided options for noise mitigation, including the use of low noise trailing edge (LNTE) technology and noise reduced operation (NRO) modes. LNTE consists of the addition of plastic or metal sawtooth serrations that can be affixed to the blade's rear edge to reduce blade trailing edge noise. Application of NRO modes limits the rotational speed of the turbines to reduce their sound emissions. For the Turbine Option 1 layout using General Electric (GE) 2.82-MW turbines, to demonstrate compliance with the applicable WAC regulatory limits at the Lease Boundary adjacent to Class A lands, select turbines would need to operate in NRO mode. Several NRO modes are available for the GE 2.82-MW turbine, depending on the turbine hub height. Those NRO modes and their corresponding sound source level characteristics were evaluated, and several modeling iterations were conducted to determine what level of NRO would be required to successfully demonstrate Project compliance.
- Modeling iterations for the Option 1 layout using the GE 2.82-MW turbine indicated that Turbine IDs 6, 7, and 8 would need to operate in NRO 106 mode to comply with the applicable 50 dBA nighttime limit at the Lease

Boundary adjacent to Class A EDNA land with a source sound power level of 106 dBA in NRO mode, as reported by the turbine manufacturer.

- Modeling iterations for the Turbine Option 1 layout using the GE 3.03-MW turbine found that Turbine IDs 6, 7, and 8 would need to be equipped with LNTE technology to comply with the applicable 50-dBA nighttime limit at the Lease Boundary adjacent to Class A EDNA lands. The maximum rated sound power level for the GE 3.03-MW turbine equipped with LNTE will be 106 dBA, as reported by the turbine manufacturer.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.11.2.5, Post-Adjudication Applicant Commitments.

4.11.2 Impacts of Proposed Action

4.11.2.1 Impacts during Construction

Noise

During construction, noise would be generated with the use of heavy machinery and equipment operations. **Table 4.11-8** summarizes equipment that may be used for the Project and estimates of construction sound levels at a reference distance of 50 feet and a far-field distance of 2,500 feet. Construction activities for Turbine Option 1 and Option 2, solar arrays, substations, and the BESS are assumed to use similar noise-generating equipment. Therefore, one estimated sound level source was calculated for all construction scenarios based on the concurrent operation of the equipment. Potential impacts from construction are presented as the comprehensive Project in Table **4.11-10a**.

The estimated composite site noise level assumes that all equipment would operate simultaneously at the given usage factor, over a standard 8-hour workday, to calculate the composite average daytime sound level. This assumption is conservative since locations and operating times of construction equipment could be different. Additionally, pile-driver operations are only expected to be needed during the construction of solar arrays and are the loudest individual piece of equipment and were included in the composite average daytime sound level.

Table 4.11-8: Estimated Lmax Sound Pressure Levels from Construction Equipment

Equipment	Lmax Equipment Sound Level At 50 feet (dBA)[(a)]	Usage Factor (%)[(b)]	Equipment Sound Level At 50 feet (dBA)	Equipment Sound Level at Closest NSR (dBA)[(c)]	Equipment Sound Level at 2,500 feet (dBA)
Crane	85	16	77	40	34
Forklift	80	40	76	39	33
Backhoe	80	40	76	39	33
Grader	85	40	81	44	38
Man Basket	85	20	78	41	35
Dozer	88	40	84	47	41
Loader	88	40	84	47	41
Scissor Lift	85	20	78	41	35
Truck	85	40	81	44	38
Welder	73	40	69	32	26

Equipment	Lmax Equipment Sound Level At 50 feet (dBA)[a]	Usage Factor (%)[b]	Equipment Sound Level At 50 feet (dBA)	Equipment Sound Level at Closest NSR (dBA)[c]	Equipment Sound Level at 2,500 feet (dBA)
Compressor	80	40	76	39	33
Concrete Pump	77	50	74	37	31
Pile Driver [d]	95	20	86	49	43
Composite				55	49

Source: Horse Heaven Wind Farm, LLC 2022
Notes:
(a) Data compiled in part from the following sources: Bolt, Beranek and Newman, Inc. 1977; FHWA 2006.
(b) The usage factor is percentage of time during operation that a piece of construction equipment is operating at full power.
(c) Closest NSR within the Lease Boundary, NSR 43 at 1,258 feet.
(d) Pile drivers are expected to be associated with solar array construction only.
dBA = A-weighted decibels; Lmax = maximum sound pressure level; NSR = noise sensitive receptor

In addition to the equipment listed in **Table 4.11-8**, generators may be used for temporary power over the approximately 19-week turbine commissioning period. Commissioning mainly includes the testing and startup of the wind turbines after they are installed, but before they begin normal operations. The generators would be relocated throughout the site as needed to facilitate turbine commissioning. The generators would be housed in a sound-attenuated container, which is specified at a maximum of 75 dBA at 50 feet. Sound emissions resulting from the generators would be low level, especially when compared to other construction equipment on site, and are not expected to add to the noise levels in the area.

Outdoor conversations may be subject to mild interference when ambient noise levels are above 55 dBA; levels above 65 dBA are considered significant interference to conversations held outdoors (EPA 1974). The estimated composite noise level of 55 dBA, shown in **Table 4.11-8,** does not exceed this guideline as a daily average noise impact. Given that there could be a noise level higher than 55 dBA at times, the construction of the Project may cause short-term, but unavoidable, noise impacts that temporarily interfere with speech communication outdoors and indoors with windows open when construction is in the area. Based on the specific location, noise levels at receptors up to 2,500 feet (49 dBA) could experience an increase to baseline noise levels up to 10 dBA for periods of time. This is expected to be limited as daytime baseline noise levels on average ranged from 37 dBA to 44 dBA and the distance attenuation calculations are conservative as they omit ground and other attenuation factors. Noise levels resulting from the construction activities could vary considerably, depending on the operations being performed and the overall condition of the equipment.

Project construction would generally occur during the day, Monday through Saturday. Furthermore, all reasonable efforts would be made to minimize the impact of noise resulting from construction activities, including implementation of standard noise reduction measures. Noise impacts from construction would be limited to the time period when construction of the closest turbine(s) to the affected NSR location(s) and would not occur throughout the entire construction stage. Due to the infrequent nature of loud construction activities at the site, the limited hours of construction, and the implementation of noise mitigation measures, the temporary increase in noise due to construction would be limited.

Blasting

Depending on subsurface conditions, blasting may be necessary to loosen rock before excavation (Horse Heaven Wind Farm, LLC 2022). Blasting is a short-duration event compared to other rock removal methods such as track rig drills, rock breakers, jack hammers, rotary percussion drills, core barrels, and/or rotary rock drills. Blasting creates a sudden and intense airborne noise potential, as well as local ground vibration. Modern blasting techniques include electronically controlled ignition of multiple small explosive charges in an area of rock. The detonations are timed so that the energy from one detonation destructively interferes with others, which is called wave canceling. Impulse (instantaneous) noise from blasts could reach up to 140 dBA at the blast location, attenuating to approximately 90 dBA at 500 feet from the blast (Horse Heaven Wind Farm, LLC 2021b). This instantaneous noise is typically less than 1 second in duration and, as such, has little impact on the overall time-weighted average at an NSR. Additionally, at 1,000 feet, the sound level would attenuate to 84 dBA. This instantaneous noise level is below typical worker health-related exposure levels for an 8-hour workday of 85 dBA; therefore, no negative health impacts would be expected from blasting. Based on this understanding, noise from this source would result in low, temporary, feasible, and limited impacts from blasting.

Vibration

Ground vibration could occur during large equipment operations and pile driving, drilling, and blasting. Vibration would be limited to normal construction hours (during the daytime), be of short duration, and occur in the direct area under construction. With the closest residence being over 1,000 feet from expected construction locations, no highly vibration-sensitive buildings or residences are located within the FTA's furthest screening distance of 100 feet for construction equipment operations.

Impact Rating

The results presented in **Table 4.11-8** and in this section are discussed in the context of the impact rating system:

- **Magnitude –** Construction noise impacts at the closest NSR locations would be medium as the noise could be loud enough at times to temporarily interfere with speech communication outdoors and indoors with windows open and could increase noise levels between 5 dBA and 10 dBA above baseline. Vibration impacts would be low and would not impact off-site receptors.
- **Duration –** The impacts of construction noise and vibration would be temporary and would only occur during construction in the immediate vicinity of an NSR, not throughout the entire period of the construction stage. As construction activities move from location to location within the Lease Boundary, noise and vibration sources would move with them. NSR locations not near the areas of construction would experience few to no impacts from distant construction equipment or activities.
- **Likelihood –** Noise impacts would be probable during the construction stage. Vibration impacts would be feasible during the construction stage during blasting and pile driving activities.
- **Spatial Extent –** The spatial extent of noise and vibration would be limited to the area currently under construction. Noise and vibration may be perceived beyond the Lease Boundary, but the impacts would be temporary.

Activities during construction of all components of the Project would result in medium, temporary, probable, and limited impacts from noise and vibration.

4.11.2.2 Impacts during Operation

This section describes the model used for the assessment of noise during Project operation, input assumptions used to calculate noise levels due to the Project's normal operation, and the results of the noise impact analysis (Horse Heaven Wind Farm, LLC 2022). Since the equipment listed above is anticipated to operate simultaneously, two modeling scenarios were considered: one with Turbine Option 1 operating with the solar arrays, substations, and BESS and the second with Turbine Option 2 operating with the solar arrays, substations, and BESS. Potential impacts from operations are presented as the comprehensive Project in **Table 4.11-10b**.

Combined Noise Impacts of Components

Turbine Option 1

The modeling results in **Table 4.11-9** are presented based on receptor locations (NSR ID) and their participation status regarding the Project (i.e., residents with whom the Applicant has a lease agreement are termed "Project participants"). The participation status identifications are as follows:

- Participant – NSR locations that are Project participants
- Outside Project – NSR locations that are not Project participants
- In Pursuit – NSR locations that are being pursued as Project participants

These results presented in **Figure 4.11-3** show that noise propagation is mainly affected by distance, with limited effects from changes in terrain. The major areas of noise are the individual turbine locations and the substations. The maximum modeled noise level at the 21 participating NSR locations was 54 dBA at NSR 214. The maximum modeled noise level at 720 non-participating NSR locations was 48 dBA, at NSR 34 and NSR 178. The maximum modeled noise level at the one NSR with an in-pursuit status was 49 dBA at NSR 211. The maximum modeled noise level at the Lease Boundary was 63 dBA (Horse Heaven Wind Farm, LLC 2022). At these NSR locations, Turbine Option 1 increased baseline noise levels between 3 dBA and 21 dBA.

Table 4.11-9: Maximum Modeled Operational Noise Levels at Residential Receptors and Boundary

NSR ID	Participation Status[(a)]	EDNA and Noise Limit (dBA)	Option 1, Modeled (dBA)	Baseline (dBA)[(b)]	Option 1, Predicted (dBA)[(c)]
214[(d)]	Participant	Class C / 70	54	33	54
34[(d)]	Outside Project	Class A / 50	48	45	48
178[(d)]	Outside Project	Class A / 50	48	46	50
211[(d)]	Participant	Class C/ 70	49	37	49
Boundary[(e)]	Outside Project	Class C / 70	63	38	63

Source: Horse Heaven Wind Farm, LLC 2022

Notes:

(a) As of November 2021.

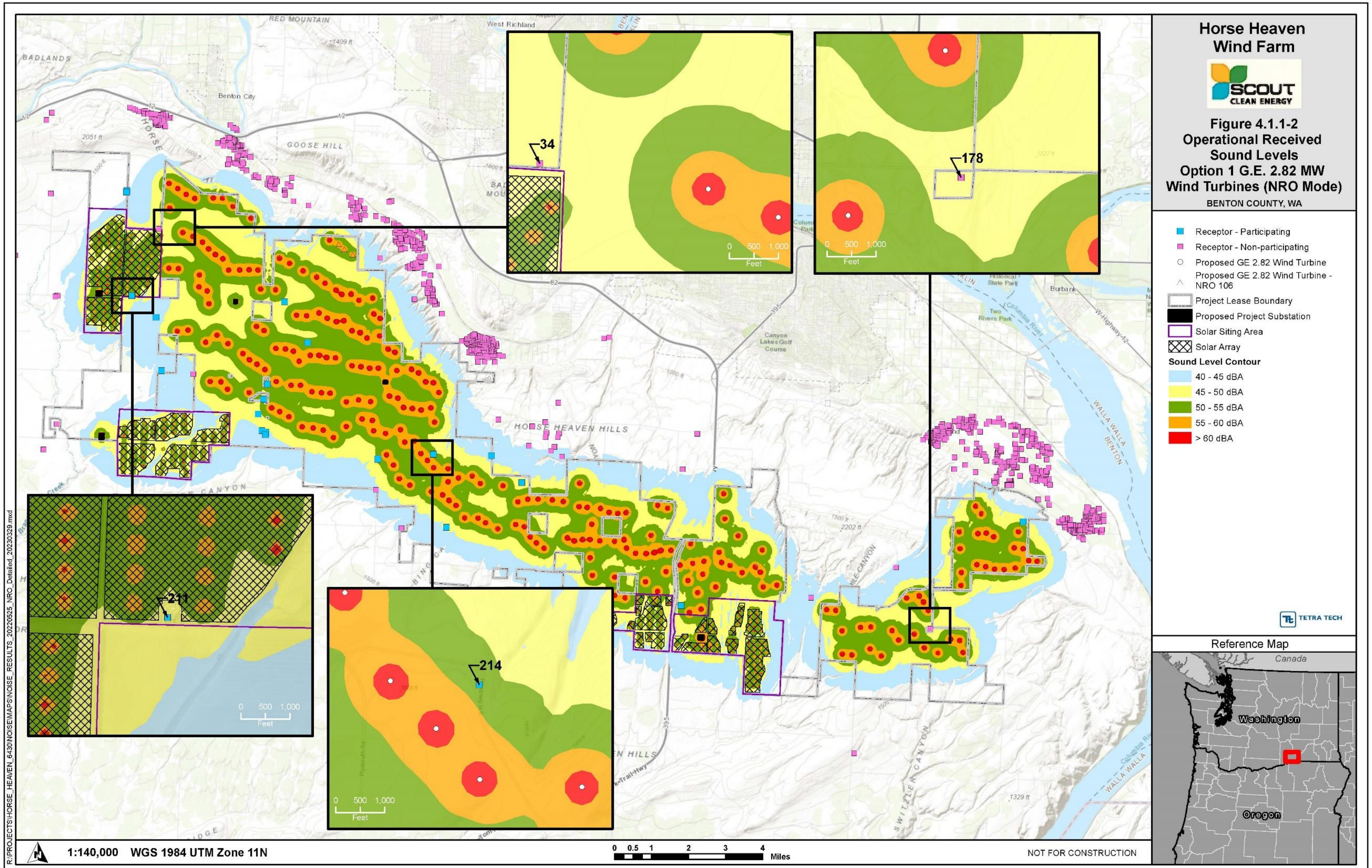
(b) Most representative baseline level to the NSR.

(c) Predicted noise level calculated by logarithmically adding the modeled and baseline noise levels together

(d) Revised modeling results from November 2021 (Table O-1, Appendix O, Horse Heaven Wind Farm, LLC 2022).

(e) Modeled noise levels provided in Horse Heaven Wind Farm, LLC's response to Data Request No. 3, July 2021 (Horse Heaven Wind Farm, LLC 2021b)

dBA = A-weighted decibels; EDNA = Environmental Designation for Noise Abatement; NSR = noise sensitive receptor



Source: Horse Heaven Wind Farm, LLC 2021c

Figure 4.11-3: Operational Received Sound Levels Option 1 G.E. 2.82 MW Wind Turbines (Noise-Reduced Operation Mode)

Turbine Option 2

The modeling results show that noise propagation is mainly affected by distance, with limited effects from changes in terrain. The major areas of noise are the individual turbine locations and the substations. The maximum modeled noise level at the 21 participating NSR locations was 48 dBA at NSR 214. The maximum modeled noise level at 720 non-participating NSR locations was 42 dBA at NSR 178. The maximum modeled noise level at the one NSR with an "in pursuit" status was 39 dBA at NSR 211. The maximum modeled noise level at the Lease Boundary was 54 dBA. At these NSR locations, Turbine Option 2 increased baseline noise levels between 2 dBA and 15 dBA. Modeling results are summarized in **Table 4.11-10** and illustrated in **Figure 4.11-4**.

Table 4.11-10: Maximum Modeled Operational Noise Levels at Residential Receptors and Boundary

NSR ID(s)	Participation Status[a]	EDNA and Noise Limit (dBA)	Option 2, Modeled (dBA)	Baseline (dBA)[b]	Option 2, Predicted (dBA)[c]
214[d]	Participant	Class C / 70	48	33	48
178[d]	Outside Project	Class A / 50	42	38	48
211[d]	In Pursuit	Class A / 50	39	37	41
Boundary[e]	Outside Project	Class C / 70	54	38	54

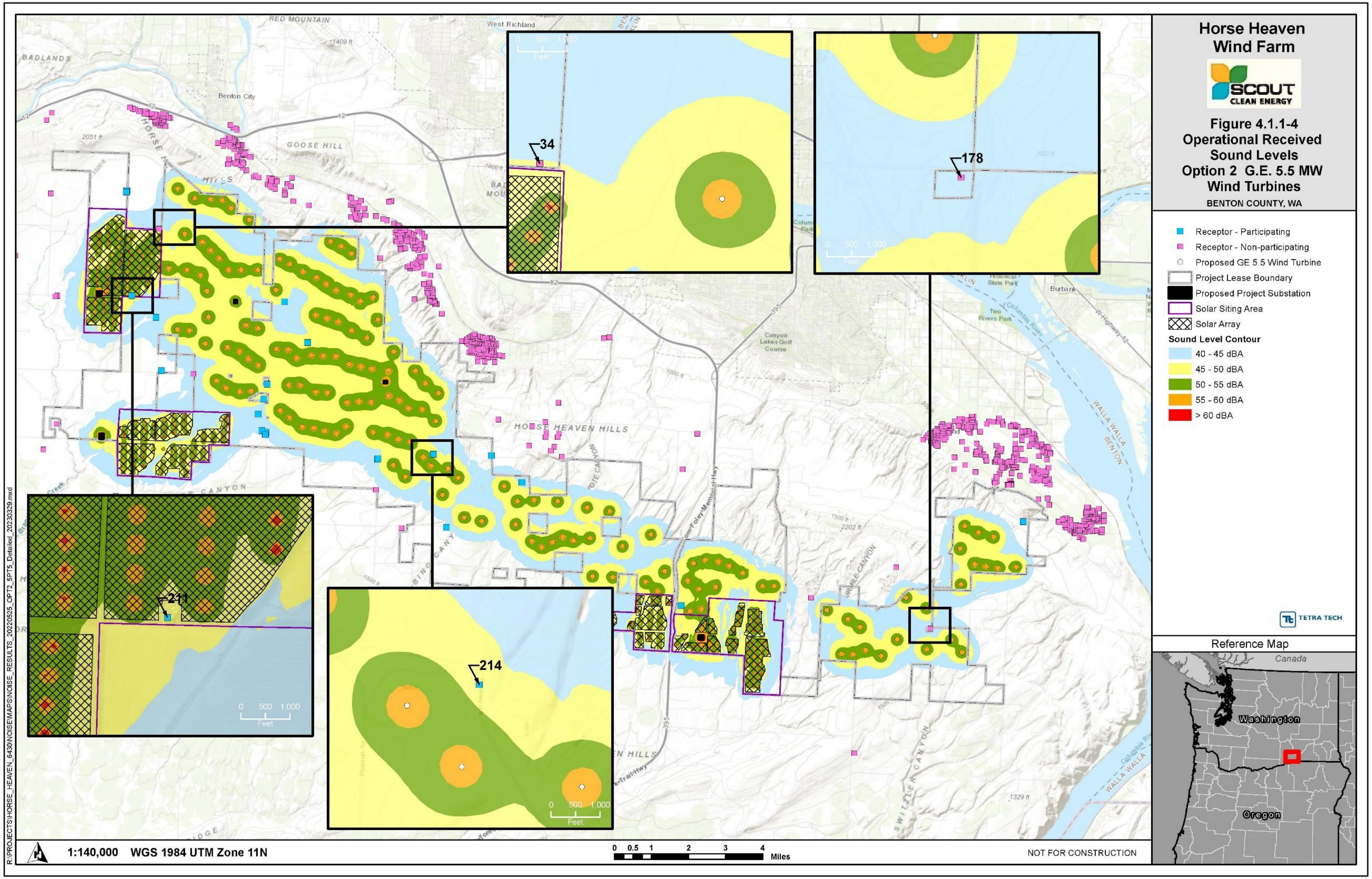
Source: Horse Heaven Wind Farm, LLC 2022
Notes:
(a) As of November 2021.
(b) Most representative nighttime baseline noise level measurement to the NSR.
(c) Predicted noise level calculated by logarithmically adding the modeled and baseline noise levels together.
(d) Table O-1, Appendix O, Horse Heaven Wind Farm, LLC 2022.
(e) Modeled noise levels provided in Horse Heaven Wind Farm, LLC's response to Data Request No. 3, July 2021 (Horse Heaven Wind Farm, LLC 2021b).
dBA = A-weighted decibels; EDNA = Environmental Designation for Noise Abatement; NSR = noise sensitive receptor

Turbine Option Summary

Maximum predicted results outlined in the tables above were evaluated against applicable WAC regulatory requirements, both at NSRs and at the Lease Boundary. For NSRs located on land with a Class A Environmental Designation for Noise Abatement (EDNA) (land zoned RL-5) and for non-participating NSRs located on Class C EDNA land (land zoned Growth Management Act Agricultural District), compliance was conservatively assessed relative to the WAC 173-60.040 50 dBA nighttime limit. The compliance status of participating NSRs located on Class C EDNA land was evaluated against the applicable daytime and nighttime 70-dBA limit for Class C lands. At the Lease Boundary, where the Project is adjacent to Class A EDNA land, compliance was assessed relative to the 50 dBA nighttime limit. At the Lease Boundary, where the Project is adjacent to Class C EDNA land, compliance was assessed relative to the 70-dBA limit.

The maximum noise impacts occurred under the Turbine Option 1 turbine layout modeled, with compliance achieved at all NSRs and at the property boundary based on the applicable WAC 173-60 regulatory limits described previously. While not all boundary locations were below the Class A noise limit, all locations with received sound levels greater than 50 dBA are classified as Class C land, where the applicable daytime and nighttime sound limit is 70 dBA.

Based on a study conducted in 2019, low-frequency noise can be underestimated in commercial wind turbine noise propagation modeling by up to 1.5 dBA (Chiu and Lung 2020). The model for this study was set up to provide conservative results that would incorporate a +/-2 dBA level of uncertainty. However, if 1.5 dBA was added to the results at the NSR locations found outside the Lease Boundary that were primarily impacted by wind turbine noise sources, the modeled results would remain at or below the Class A limit of 50 dBA.



Source: Horse Heaven Wind Farm, LLC 2022

Figure 4.11-4: Operational Received Sound Levels Option 2 G.E. 5.5 MW Wind Turbines

Vibration

Ground vibrations are not expected to occur during Project operation under either turbine option or as a result of any Project components. A study of the effect of the wind-turbine structure interaction on the behavior of a turbine foundation and the generation of ground-based vibrations around a working commercial wind turbine found that commercial wind turbines create vibration less than 0.001 millimeter/second (mm/s) at 1 kilometer (0.6 miles) (Gonzalez-Hurtado et al. 2017). This is well below the understood vibration threshold of perception of 0.51 mm/s; therefore, the vibration from wind turbine operations would be negligible.

In addition to vibration that travels through the ground, vibration can also travel through the air as infrasound. Infrasound levels are low when human sensitivity to these frequencies is accounted for. Even close to the turbines, the infrasonic sound pressure level is much below the normal hearing threshold, and infrasound is thus not considered a problem with commercial wind turbines (Møller and Peterson 2011).

Impact Rating

The results presented above are discussed in the context of the impact rating system:

- **Magnitude** – Noise levels at the closest NSR locations would be medium as the noise impacts could be at or near the WAC nighttime noise limit of 50 dBA, would not interfere with outdoor or indoor activities, but would increase noise levels more than 10 dBA at NSR locations with low baseline noise levels.
- **Duration –** The duration of noise impacts would be long term for the entirety of Project operation.
- **Likelihood –** The noise impacts would be unavoidable during operation.
- **Spatial Extent –** The special extent would be local and confined to NSR locations in close proximity to wind turbines.

Noise impacts from operation are expected to be moderate at NSR locations in close proximity to wind turbines. Turbine Option 2 is predicted to generate lower noise levels than Turbine Option 1, but under both options, the predicted noise levels would be less than the applicable noise limit. Activities during operation of all components of the Project would result in medium, long term, unavoidable and local impacts from noise and vibration.

4.11.2.3 Impacts during Decommissioning

Noise

Due to the limited information available regarding decommissioning activities, noise impacts during this period are not specifically calculated. The primary sources of noise during decommissioning are expected to be heavy equipment operations similar in scope to those used during construction, but during decommissioning this noise would have a shorter duration at each location. Furthermore, no pile drivers or blasting are expected to be needed during decommissioning. However, it is reasonable to assume that jackhammers or similar equipment may be needed to break up concrete. It is therefore expected that noise impacts would be less than or similar to those calculated for construction, and these impacts can be used as a conservative estimate. Potential impacts from construction are presented as the comprehensive Project in **Table 4.11-11c**.

Vibration

Ground vibration could occur during large equipment operations during decommissioning. Vibration would be limited to normal construction hours (during the daytime), would be of short duration, and would occur in the area directly under the place of use. No drilling, pile driving, or blasting is expected to occur during this stage;

therefore, vibration caused by decommissioning is expected to be less than vibration caused by construction. With the closest residence being over 1,000 feet from expected construction locations, no highly vibration-sensitive buildings or residences were located within the FTA's furthest screening distance of 100 feet for construction equipment operations.

Impact Rating

The results presented in Section 4.11.2.1 are discussed in the context of the adopted impact rating system below:

- **Magnitude** – Noise levels at the closest NSR locations would be medium as the noise impacts could be loud enough at times to temporarily interfere with speech communication outdoors and indoors with windows open and could increase noise levels between 5 dBA and 10 dBA above baseline. Vibration impacts are not expected.
- **Duration –** The duration of decommissioning noise and vibration impacts would be temporary and occur only when decommissioning is occurring in the immediate area of a sensitive receptor and not during the entire period of this stage.
- **Likelihood –** Noise impacts would be probable during the decommissioning stage. Vibration impacts are unlikely to occur during the construction stage.
- **Spatial Extent –** The spatial extent for noise and vibration would be limited to the area currently under construction. Noise may be perceived beyond the Lease Boundary, but the impacts would be temporary.

Activities during decommissioning of all components of the Project would result in medium, temporary, probable, and limited impacts from noise and vibration.

4.11.2.4 Recommended Mitigation Measures

The Washington Energy Facility Site Evaluation Council (EFSEC) has identified additional mitigation measures for the Project to avoid impacts on noise and vibration. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

Construction and Decommissioning

The following measures are recommended for mitigation of noise resulting from Project construction and decommissioning:

N-1:[55] Avoid laydown and equipment storage/parking areas closer than 2,500 feet from the nearest NSR location.

Rationale: These laydown and storage areas would have more noise sources for longer periods of time than other areas; therefore, siting these locations further from NSR locations would limit the sound level and the duration that such equipment could impact an NSR.

N-2: Limit large, noise-generating equipment operations, such as earth-moving equipment, cranes, and trucks, as outlined in **Table 4.11-8**, to daytime hours (between 7 a.m. and 10 p.m.), and limit the loudest and

[55] N-: Identifier of numbered mitigation item for Noise

most impulsive pieces of construction equipment and activities, such as pile-driver operations and blasting, to typical working hours only: 7 a.m. to 6 p.m., Monday through Saturday.

Rationale: This measure would ensure that a typical workday would not include pile-driver operations or blasting during evening hours (6 p.m. to 10 p.m.) but could include some on-site activities during nighttime hours such as early-morning setup and preparation for the workday. Nighttime operations would be atypical. The purpose is to limit noise impacts during sensitive hours while allowing contractors some flexibility.

N-3: Monitor noise during nighttime construction operations (between 10 p.m. and 7 a.m.), when construction activities have the potential to impact NSRs or reduce activities to ensure that construction noise does not exceed state noise limits.

Rationale: This monitoring would take place throughout the entirety of the nighttime hours or until construction activities cease.

N-4: Update the Applicant's noise complaint resolution procedure to better address and respond to noise complaints from the public. The updates include the following: a complaint hotline during construction and providing a phone number to be posted on signage throughout the construction project and ensure that current site contact information is maintained with EFSEC. The Applicant would log all correspondence and promptly follow up with inquiries to provide appropriate resolution. The correspondence and resolutions would be logged throughout the construction process, and the log would be made available to EFSEC during routine reporting or upon request. During the operation stage, the site would be staffed and contact information would be available.

Rationale: This measure would better address and respond to noise complaints from the public.

Operation

Additional recommendations for mitigation of operational noise include the following:

N-5: Establish a noise complaint resolution procedure similar to that proposed for construction and decommissioning to better address and respond to noise complaints.

Rationale: This measure would better address and respond to noise complaints from the public.

4.11.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[56]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for noise and vibration in the Draft EIS, and the impact ratings remain the same.

[56] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

4.11.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This Environmental Impact Statement weighs the potential impacts from noise that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.11-11a, 4.11-11b, and 4.11-11c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to noise and vibration.

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Table 4.11-11a: Summary of Potential Impacts on Noise and Vibration during Construction of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Noise and Vibration (Noise from Construction Equipment)	**Comprehensive Projec**t	Most noise sensitive receptors would receive sound levels below 55 dBA during construction, with the potential to be up to 10 dBA over baseline. One noise sensitive receptor could receive sound levels at 55 dBA during construction of one turbine.	Medium	Temporary	Probable	Limited	**N1:** Avoid laydown and equipment storage/parking areas near NSRs **N2:** Limit the use of noise-generating equipment to daytime hours (7 a.m. to 10 p.m.) and loud equipment to working hours (7 a.m. to 6 p.m.) **N-3:** Monitor noise during nighttime construction (10 p.m. to 7 a.m.) with the potential to impact NSRs **N-4:** Update the Applicant's noise complaint resolution procedure to include contacting and reporting details	None identified
Noise and Vibration (Noise from Blasting)	**Comprehensive Project**	Sound levels can reach up to 140 dBA at blast locations and 90 dBA at 500 feet.	Low	Temporary	Feasible	Limited	**N2:** Limit blasting to working hours (7 a.m. to 6 p.m.)	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC can identify to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that remain even after all mitigation measures identified by EFSEC have been applied.
dBA = A-weighted decibels; EFSEC = Washington Energy Facility Siting Evaluation Council; NSR = Noise Sensitive Receptor

Table 4.11-11b: Summary of Potential Impacts on Noise and Vibration during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Noise and Vibration (Operational Noise)	**Comprehensive Project**	Noise would be generated by the operation of wind turbines, inverters, transformers, and the corona effect.	Medium	Long Term	Unavoidable	Local	**N-5:** Establish a noise complaint resolution procedure similar construction	None identified

Notes:
[a] The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC can identify to further reduce the impacts. See Section 4.1 Introduction for details.
[d] Significant unavoidable impacts are those that remain even after all mitigation measures identified by EFSEC have been applied.
EFSEC = Washington Energy Facility Siting Evaluation Council; NSR = Noise Sensitive Receptor

Table 4.11-11c: Summary of Potential Impacts on Noise and Vibration during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Noise and Vibration (Noise from Decommissioning Equipment)	**Comprehensive Project**	Most noise sensitive receptors would receive sound levels below 55 dBA during construction, with the potential to be up to 10 dBA over baseline. One noise sensitive receptor could receive sound levels at 55 dBA during construction of one turbine.	Medium	Temporary	Probable	Limited	**N1:** Avoid laydown and equipment storage/parking areas near NSRs **N2:** Limit the use of noise-generating equipment to daytime hours (7 a.m. to 10 p.m.) and loud equipment to working hours (7 a.m. to 6 p.m.) **N-3:** Monitor noise during nighttime decommissioning (10 p.m. to 7 a.m.) with the potential to impact NSRs **N-4:** Update the Applicant's noise complaint resolution procedure to include contacting and reporting details	None identified

Notes:
(a) The impacts related to each component, including, "comprehensive Project" were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC can identify to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that remain even after all mitigation measures identified by EFSEC have been applied.
dBA = A-weighted decibels; EFSEC = Washington Energy Facility Siting Evaluation Council; NSR = Noise Sensitive Receptor

4.11.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to noise and vibration from the construction, operation, and decommissioning of the Project would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.12 Recreation

This section describes impacts on recreational uses and areas that could occur in the study area as a result of the construction, operation, and decommissioning of the Horse Heaven Wind Farm (Project, or Proposed Action) proposed by Horse Heaven Wind Farm, LLC (Applicant), or under the No Action Alternative. Section 3.12 presents the affected environment for recreation. Safety of recreation enthusiasts is discussed in this section and Section 4.13 Public Health and Safety presents additional analysis of safety within the Project vicinity and Lease Boundary.

Under the Washington State Environmental Policy Act, this Environmental Impact Statement (EIS) weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when determining the significance of identified potential impacts (WAC 197-11-330 and WAC 197-11-794). These impacts were qualitatively assessed based on the method of analysis described in Section 4.12.1. The impact rating system is summarized in **Table 4.12-1**.

Table 4.12-1: Impact Rating Table for Recreation from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

As identified in **Table 4.12-2**, the determination of impact magnitude is based on the continued ability of an individual to use a recreational facility, the impact on the quality of the recreational experience, and the potential for the impact to be a public health and safety concern.

Table 4.12-2: Criteria for Assessing Magnitude of Impacts on Recreation Resources

Magnitude of Impacts	Description
Negligible	**Use:** Use of recreational areas would remain unchanged. **Recreational Experience:** Quality of recreational experience for users or their satisfaction with the recreational resource remains unchanged. **Public Health and Safety:** No potential of an incident to occur affecting public health and safety.
Low	**Use:** Recreational activities could be measurably altered, but impacts would not change the ability of recreationists to use the area or perform the activity. **Recreational Experience:** Quality of recreational experience for users may change. Some values that recreationists may deem as important to their individual experience may become altered. **Public Health and Safety:** No potential of an incident to occur affecting public health and safety.
Medium	**Use:** Recreational activities could be considerably altered. Recreationists may experience slight crowding or concern with the Project affecting the ability of previous recreational use. **Recreational Experience:** Quality of recreational experience for users would change measurably. Most values that a recreationist deems as important to their individual experience would become altered. **Public Health and Safety:** A single public health and safety incident could occur.
High	**Use:** Recreational activities could be severely altered or recreationists may be unable to use the resource altogether. **Recreational Experience:** Quality of recreational experience for users would change considerably. All values that a recreationist deems as important to their individual experience may become altered. **Public Health and Safety:** Multiple incidents affecting public health and safety or a fatality could occur.

Background

For some recreationists, undeveloped lands, scenery, and the quiet of nature are important aspects of the recreational experience. Recreational users' sensitivity to visual quality and landscape character varies depending on their reasons for visiting an area. Impacts associated with the Project that may affect the visual setting, noise, and access to recreational sites are noted in this section and evaluated in greater detail in other sections, as follows:

- Impacts related to visual setting (including light and glare) are addressed in Section 4.10.
- Impacts related to noise and vibration are addressed in Section 4.11.
- Impacts related to traffic are addressed in Section 4.14.

4.12.1 Method of Analysis

The study area for recreation consists of the Lease Boundary and a 25-mile area surrounding the Lease Boundary, as defined in the Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2022). Laws and regulations used to determine the Project's potential impacts on recreation are summarized in Table 3.12-1. Information reviewed to identify the potential impacts on recreational uses and areas in the study area was obtained from federal agencies, state agencies, local planning documents, and public scoping. Impacts on recreation within the study area were qualitatively assessed based on the impact evaluation approach defined in Section 4.1.

Applicant Commitments

The Applicant identified measures and/or best practices that are intended to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on recreation resources are discussed in Section 2.1.3 and summarized below.

- The Applicant would construct support facilities with non-reflective materials in muted tones and would use white or light gray, non-reflective paint on turbines to reduce the need for daytime aviation lighting and minimize glare from the turbines as required by Federal Aviation Administration Advisory Circular 70/7460-1M.
- As applicable, Project construction and operation would follow site-specific best management practices to minimize potential impacts on noise, traffic, and visual surroundings, as described in the respective resource sections of this application.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.12.2.6, Post-Adjudication Applicant Commitments.

4.12.2 Impacts of Proposed Action

Recreation sites discussed in Section 3.12 may be affected by the Project. These sites offer recreational opportunities, including parks and places for camping, hiking, hunting on public lands, fishing, boating, swimming, wildlife viewing (including bird watching), and recreational sports (e.g., paragliding).

The study area includes the Ice Age Floods National Geologic Trail (IAF-NGT). However, the Project's Lease Boundary is outside of the physical Ice Age flood pathway as identified on the IAF-NGT, Washington Section Map (DNR 2016). The Project's components would not directly impact the prominent naturally vegetated steep slopes and elevated ridges that define the Columbia Basin landscape and are uniquely a product of the Ice Age floods (Horse Heaven Wind Farm, LLC 2022), though indirect impacts on the visual setting would occur. The 24 features within the study area are identified in Section 3.12, Table 3.12-4. The nearest IAF-NGT feature is Badger Coulee, approximately 0.84 miles north of the Project Lease Boundary. None of the IAF-NGT's features are within the Lease Boundary, and the IAF-NGT is not analyzed further. Visual setting is discussed in more detail in Section 4.10.

Up to 10 turbines,15.3 miles of collector cable, and a portion of the Sellards Solar Field may be located on lands that would be leased from the Washington Department of Natural Resources (DNR). The 10 turbines located on DNR-administered land would limit recreational activities to outside the footprint of each turbine. Passive recreational uses within the proposed transmission line corridor would be possible on DNR land where practical and are not addressed further.

The portion of the Sellards Solar Field that overlaps DNR-administered land would limit recreational activities to outside the solar field's fence. Currently, hunting on public lands, hiking, and bird watching may occur on these DNR-administered lands, and impacts related to the construction, operation, and decommissioning of the Sellards Solar Field are analyzed in the following subsections.

Construction, operation, and decommissioning activities would take place a substantial distance from waterways or wetlands and are not likely to cause water quality impacts in the event of an accidental release. No in-water construction or access to the Project by water is proposed; therefore, the activities would not conflict with in-water recreation within the study area and are not analyzed further herein.

Impacts relating to the construction, operation and maintenance, and decommissioning of the components of the Project are discussed in more detail below.

4.12.2.1 Impacts during Construction

Construction activities could limit access to recreational facilities or conflict with recreational uses. Impacts related to the construction of the two turbine options and other components are described below. Impacts of the construction of the overall Project are described last.

At peak construction periods, workers may seek accommodation in RV parks or campgrounds. The Applicant estimates that 62 percent of the positions during the construction of Phase 1 of the Project, the phase requiring the most workers, would be local workers. Non-local employment would average about 113 workers over the 11-month construction period, with a peak of approximately 177 non-local workers employed by the Project. Temporary accommodation in the study area includes RV parks and campsites. Facilities in Benton and Franklin Counties include 12 RV parks and campgrounds, with a total of 1,320 RV spaces (Horse Heaven Wind Farm, LLC 2022). Benton County may experience small increases in costs of park use and recreation due to related temporary increases in population.

Turbine Option 1

Of all the Project components, installation of the turbines is expected to require the largest number of workers. However, turbine installation would likely be phased by specialty (earthwork, concrete, construction of components, etc.), minimizing the quantity of total RV park or campground space required for housing at one time.

Visual impacts on recreation resources introduced during construction would vary depending on the specific recreational resource being considered. Depending on the location of a specific recreational resource, views of construction activities or turbines may be fully or partially obstructed or viewers may have more wide-open views. Impacts from light would be negligible, while impacts from glare would be low during the construction of the Project. Visual effects resulting from installation of the turbines, including light and glare, are addressed in more detail in Section 4.10.

Construction-related noise would be temporary and would be noticeable at recreation sites that are close to the Lease Boundary. Noise could affect the recreational experience of those engaged in hunting on public lands, fishing, or camping nearby. See Section 4.11 for a detailed analysis of noise generated by installation of the turbines.

Construction vehicles and the transportation of materials could cause temporary delays on local roads used to access recreational activities in the study area during the installation of turbines. Public roads would require intersection improvements, and access roads would have to be constructed. The magnitude of potential impacts related to each recreational site during the installation of turbines within the study area is summarized in **Table 4.12-3**. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during construction.

Installation of turbines would introduce a risk to paragliders and hang gliders who use the 20 launch sites known within the study area. The main risks to these recreationists would be:

- Losing safe landing space in the event of an in-flight emergency requiring an unanticipated landing in an area containing turbines and supporting infrastructure.
- Collision with a turbine, supporting infrastructure, or construction equipment if a paraglider or hang glider loses the ability to steer mid-flight.

Construction activities under Turbine Option 1 would result in impacts on recreation resources as follows:

- **Recreation – Use:** Construction under Turbine Option 1 would limit recreational activities on public land in areas near construction and may impede cyclists’ use of established routes during the transportation of equipment and materials, resulting in a local, medium, short term, unavoidable impact during construction.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by construction under Turbine Option 1 could occur at nearby recreation sites, resulting in a high, unavoidable, regional impact on recreational sites beyond neighboring receptors. Impacts would be long term once the turbines were constructed.
- **Recreation – Public Health and Safety:** Construction under Turbine Option 1 would have the potential to affect the health and safety of paragliders and hang gliders regionally, resulting in a medium, unavoidable, long term impact for the life of the Project.

Turbine Option 2

The impacts on recreation during the Project’s construction stage under Turbine Option 2 would be similar to those described for Turbine Option 1, as follows:

- **Recreation – Use:** Construction under Turbine Option 2 would limit recreational activities on public land in areas near construction and may impede cyclists’ use of established routes during the transportation of equipment and materials, resulting in a local, medium, short term, unavoidable impact during construction.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by construction under Turbine Option 2 could occur at nearby recreation sites, resulting in a high, unavoidable, regional impact on recreational sites beyond neighboring receptors. Impacts would be long term once the turbines were constructed.
- **Recreation – Public Health and Safety:** Construction under Turbine Option 2 would have the potential to affect the health and safety of paragliders and hang gliders regionally, resulting in a medium, unavoidable, long term impact for the life of the Project.

Solar Arrays

The three proposed solar arrays would have common impacts on recreation during the Project’s construction stage.

Similar to the construction of the turbines, workers may seek accommodation in RV parks or campgrounds during peak construction periods.

Visual impacts on recreation resources would be limited due to the solar arrays' low profile. Construction activities and the presence of equipment and work crews during construction could be visible from nearby recreational sites. Impacts from light and glare would vary depending on the specific recreational resource being considered. Visual effects resulting from construction of the solar arrays are addressed in more detail in Section 4.10.

Construction-related noise would be temporary and is not expected to be noticeable at most recreation sites. Noise could affect the recreational experience of those engaged in the use of multi-use trails, hunting on public lands, fishing, or camping nearby. See Section 4.11 for a detailed analysis of noise generated by construction of the solar arrays.

Minor delays on local roads used to access recreational activities are expected during construction of the solar arrays due to the transportation of construction materials. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during construction.

The construction of the solar arrays would introduce a risk to paragliders and hang gliders. The main risk would be the loss of safe landing space in the event of an in-flight emergency requiring an unanticipated landing in an area containing solar arrays, supporting infrastructure, or construction equipment.

Construction of the Sellards Solar Field would restrict access to an entire parcel of DNR-administered land and may remove land use that the parcel currently offers recreationists.

Construction of the solar arrays would result in impacts on recreation resources, as follows:

- **Recreation – Use:** The Project's potential to affect access to public land resulting from construction of the Sellards Solar Field would result in a high, long term, unavoidable, limited impact.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by construction of the solar arrays could occur, resulting in a regional, high, unavoidable impact on recreational sites beyond neighboring receptors. Impacts would be long term once the solar arrays were constructed.
- **Recreation – Public Health and Safety:** Construction of the solar arrays would have the potential to affect the health and safety of paragliders and hang gliders regionally, resulting in a medium, unavoidable, long term impact for the life of the Project.

Battery Energy Storage Systems

The three locations proposed for the construction of up to two battery energy storage systems (BESS) would have common impacts on recreation during the Project's construction stage. Activities during the Project's construction stage for the BESS would last approximately nine months and may impact recreational opportunities within the study area.

Visual impacts on recreation resources would be negligible due to the BESS' low profile and features in the area being taller than the BESS. Impacts from light and glare would be negligible. Construction work would be concentrated during daylight hours, minimizing the potential need for temporary night-time lighting. Visual effects resulting from construction of the BESS are addressed in more detail in Section 4.10.

Impacts caused by construction-related noise would be temporary and are not expected to be noticeable at most recreation sites. See Section 4.11 for a detailed analysis of noise generated by the construction of the BESS.

Delays on local roads used to access recreational activities are not expected during construction of the BESS due to the small number of large components and fewer trips required to transport construction materials. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during construction.

Construction of the BESS is not expected to pose a risk to paragliders and hang gliders who use the 20 launch sites known within the study area. The proposed disturbance footprint for the BESS is negligible compared to other components, and paragliders are expected to be able to easily avoid emergency landing within the construction area of the BESS.

Construction activities for the BESS would result in negligible, temporary, feasible, local impacts on recreation use, experience, and public health and safety.

Substations

The five proposed substations would have common impacts on recreation during the Project's construction stage. Activities during the construction of the substations would last less than six months and would have a negligible impact on recreational opportunities within the study area due to the smaller disturbance footprint and limited height compared to other Project components.

Visual impacts on recreation resources would be limited during construction of the substations. Construction activities and the presence of equipment and work crews during construction could be visible from nearby recreational sites. Impacts from light and glare would vary depending on the specific recreational resource being considered. Visual effects resulting from construction of the substations are addressed in more detail in Section 4.10.

Construction-related noise would be temporary and is not expected to be noticeable at recreation sites. See Section 4.11 for a detailed analysis of noise generated by the construction of the substations.

Delays on local roads used to access recreational activities could occur during construction of the substations during the transportation of construction materials. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during construction.

Construction of the substations is not expected to impact existing recreational paragliding and hang gliding activity. The proposed disturbance footprint and construction area for the substations is negligible compared to other components of the proposed Project, and paragliders and hang gliders are expected to be able to easily avoid landing within the fenced area of the substations.

Compared to the construction of other infrastructure, the potential to affect the health and safety of recreationists using the area for paragliding and hang gliding is unlikely, and therefore results in a negligible impact. Construction activities are considered temporary due to the short time required during the construction period in comparison to the turbines and solar arrays. Impacts may occur to neighboring receptors.

Construction activities for the substations would result in negligible, temporary, feasible, and local impacts on recreation use, experience, and public health and safety.

Comprehensive Project

Construction of the combined Project components would result in both direct and indirect impacts on recreationists who use the Project's study area for recreational activities.

Indirect impacts related to visual resources and noise could occur at recreation sites. Paragliders' and hang gliders' safety would be affected by the construction of the Project. Construction vehicles and the transportation of materials could cause temporary delays on local roads used to access recreational activities in the study area during construction. Public roads would require intersection improvements, and new access roads would have to be constructed.

RV parks and campgrounds may have increased occupancy during construction of the comprehensive Project. On-site construction activities are expected to employ an average of 300 workers during the Project's construction period, and non-local employment would average approximately 113 workers. Existing limits on the length of stay in public camping areas would minimize any potential impacts on park users. Benton County may experience small increases in costs for park use and recreation due to related temporary increases in population.

Activities during construction of all components of the Project would result in impacts on recreation, as follows:

- **Recreation – Use:** The comprehensive Project's potential to affect the use of public land near the Project and access to public land resulting from the construction of the Sellards Solar Field would result in a local, unavoidable, high, long term impact.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by the construction of the comprehensive Project could occur at nearby recreation sites, resulting in a high, unavoidable, regional impact beyond neighboring receptors. The long term impact would occur throughout the life of the Project.
- **Recreation – Public Health and Safety:** The comprehensive Project's potential to affect the health and safety of paragliders and hang gliders would result in a regional, medium, unavoidable long term impact for the life of the Project.

4.12.2.2 Impacts during Operation

The Project's operation stage would result in direct and indirect adverse impacts on recreation resources. Impacts would be long term during the Project's operational life of up to 35 years (Horse Heaven Wind Farm, LLC 2022).

Transportation-related impacts are not expected for existing recreational uses during operation of any of the Project components, due to the small operations team, and are therefore not analyzed for this stage. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during operation.

Impacts related to the operation stage of the two turbine options and other components are described below. Impacts of the operation of the overall Project are described last.

Turbine Option 1

The Project's impacts on recreation in the study area during the operation stage under Turbine Option 1 would be measurable.

Long term visual impacts on recreation resources would be measurable during the operation stage of Turbine Option 1. Areas identified as having potential visibility of large numbers of the Project's proposed turbines include:

- The Horse Heaven Hills to the west and southwest of the Lease Boundary
- Areas on the southwest-facing slopes of the Rattlesnake uplift formation:
  - Red Mountains

- Candy Mountains
- Badger Mountains

- Areas ranging from approximately 8 to 10 miles to the north, northeast, and east of the Lease Boundary, including parts of the Tri-Cities urbanized area and agricultural areas beyond (SWCA 2022).

Recreational areas within or adjacent to the Lease Boundary with foreground views are likely to have more views of the turbines given their proximity to the Project's infrastructure. While an analysis could not be completed for all recreational sites due to a lack of key observation points, it is expected that there would be a high visual impact on the Badger Mountain Centennial Preserve, Chandler Butte, and the McBee Trailhead. A medium visual impact could be experienced by recreationists at the McNary National Wildlife Refuge. The turbine towers would be painted off-white with a non-reflective coating, and aircraft-activated aviation lighting would be mounted on the turbine nacelles, in accordance with Federal Aviation Administration and Washington State regulations. Impacts from light would be low, while impacts from glare would be negligible during the operation of the Project. The magnitude of potential impacts related to each recreational site during the operation of turbines within the study area is summarized in **Table 4.12-3**. Visual effects resulting from installation of the turbines, including light and glare, are addressed in more detail in Section 4.10.

Operational noise levels would be similar to existing noise levels at most recreational sites due to the distances between the Project and most areas used for recreation. Operational noise may be experienced by recreational users at the recreation areas that are closest to the Lease Boundary, such as Johnson Butte and the Horse Heaven Cemetery. The magnitude of potential impacts related to each recreational site during the operation of turbines within the study area is summarized in **Table 4.12-3**. Section 4.11 further describes the impacts and mitigation related to noise.

Operation of the Project would impact existing recreational paragliding and hang gliding activity based on launch and landing locations from example flight paths (Horse Heaven Wind Farm, LLC 2022; Paragliding Forum n.d.). The Project would pose a risk to paragliders and hang gliders who use the 20 launch sites known within the study area. The main risks would be:

- The direct loss of safe landing space in the event of an in-flight emergency requiring an unanticipated landing in an area containing turbines and supporting infrastructure
- Collision with a turbine or supporting infrastructure if a pilot loses the ability to steer mid-flight

Light aviation traffic in the vicinity of a wind farm could also be impacted by wake zones created by the wind turbines' turbulence while operating. At wind speeds above approximately 7 miles per hour, caution is required if the flight path is within approximately 3,000 feet downwind of the turbines.

Activities during operation under Turbine Option 1 would result in impacts on recreation resources as follows:

- **Recreation – Use:** Operation under Turbine Option 1 would limit recreational activities on public land in areas near construction, resulting in a low, long term, unavoidable impact on local recreation use. Construction under Turbine Option 1 would have indirect visual impacts that would impact recreation users. Specifically, Turbine Option 1 does not align with Parks, Recreation, Open Space, and Historic Preservation Goal 3, which works to conserve visually prominent, naturally vegetated steep slopes and elevated ridges that define the Columbia Basin landscape and are uniquely a product of the ice age floods.

- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by operation under Turbine Option 1 could occur at nearby recreation sites, resulting in a regional, long term, low, unavoidable impact on recreational sites beyond neighboring receptors.
- **Recreation – Public Health and Safety:** Operation under Turbine Option 1 would have the potential to affect the health and safety of paragliders and hang gliders regionally, resulting in a medium, unavoidable, long term impact for the life of the Project.

Turbine Option 2

Impacts on recreation during the Project's operation stage under Turbine Option 2 would be similar to those described for Turbine Option 1 and would be more distinct visually due to the increased height of the turbines. Impacts during operation under Turbine Option 2 are summarized below:

- **Recreation – Use:** Operation under Turbine Option 2 would limit recreational activities that occur on public land in areas near construction, resulting in a low, long term, and unavoidable impact on local recreation use. The operation of Turbine Option 2 would have indirect visual impacts that would impact recreation users. Specifically, Turbine Option 2 does not align with Parks, Recreation, Open Space, and Historic Preservation Goal 3 which works to conserve visually prominent naturally vegetated steep slopes and elevated ridges that define the Columbia Basin landscape and are uniquely a product of the ice age floods.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by operation under Turbine Option 2 could occur at nearby recreation sites, resulting in a regional long term, low, and unavoidable impact on recreational sites beyond neighboring receptors.
- **Recreation – Public Health and Safety:** Operation under Turbine Option 2 would have the potential to affect the health and safety of paragliders and hang gliders regionally, resulting in a medium, unavoidable, long term impact for the life of the Project.

Solar Arrays

The three proposed solar arrays would have common impacts on recreation during the Project's operation stage. The impacts of the proposed solar arrays on recreation during this stage would be measurable and would affect recreational opportunities within the study area.

The County Well Road, Sellards Road, and Bofer Canyon solar arrays would be potentially visible from approximately 45 percent, 51 percent, and 31 percent, respectively, of the area located within 5 miles of the Project (Horse Heaven Wind Farm, LLC 2022). The strong horizontal lines of the solar arrays would contrast with the organic forms and colors of the existing landform and vegetation. Section 4.10 describes the impacts on visual resources caused by operation of the solar arrays.

During operation of the solar arrays, noise would be associated with the transformers and inverters that support the solar array infrastructure. Electronic noise from inverters can be audible, but it is often reduced by a combination of shielding, noise cancellation, filtering, and noise suppression. Impacts from noise during operation of the solar arrays are not expected to affect recreational sites. See Section 4.11 for a detailed analysis of noise generated by installation of the turbines.

Operation of the solar arrays would pose a risk to paragliders and hang gliders. The main risk would be losing safe landing space in the event of an in-flight emergency requiring an unanticipated landing in an area containing solar arrays and supporting infrastructure. While some launch sites are seemingly distant from the solar arrays, flight records of over 60 miles have been recorded in the online paragliding database, and flight paths may traverse the Lease Boundary (Paragliding Forum n.d.).

The closest launch site to the proposed solar array located near Sellards Road is the McBee Road launch site, approximately 1 mile west of the solar siting area boundary. The closest launch site to the proposed solar array near County Well Road is also the McBee Road launch site, approximately 5 miles northwest of the solar siting area boundary. The closest launch site to the proposed solar array near the Bofer Canyon Substation is Jump Off Joe, approximately 2.7 miles northeast of the solar siting area boundary. Extra precautions would have to be taken by pilots if they needed to land near the solar fields.

Operation of the Sellards Solar Field would restrict access for recreationists. Sellards Solar Field would require a fence around the facility, which would include a parcel of DNR-administered land.

Activities during operation of the solar arrays would result in impacts on recreation resources:

- **Recreation – Use:** The Project's potential to affect access to public land resulting from the operation of the Sellards Solar Field would result in a limited, unavoidable, high, and long term impact.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources produced by the operation of the solar arrays could occur at recreation sites, resulting in a low, unavoidable impact on recreational sites regionally. The long term impacts would occur for the life of the Project.
- **Recreation – Public Health and Safety:** Operation of the solar arrays would have the potential to affect the health and safety of paragliders and hang gliders regionally, resulting in a medium, unavoidable, long term impact for the life of the Project.

Battery Energy Storage Systems

The three proposed BESS would have common impacts during the operation stage. The impacts of the proposed BESS on recreation during the operation stage would be measurable and would impact recreational opportunities within the study area.

Visual impacts on recreation resources would be negligible due to the BESS' low profile and features in the area being taller than the BESS. Impacts from light and glare would be negligible. Visual impacts resulting from the operation of the BESS are addressed in more detail in Section 4.10.

Noise from BESS is typically associated with battery storage container ground-level cooling equipment and is not expected to impact recreational sites.

Operation of the BESS is not expected to pose a risk to paragliders and hang gliders. The proposed disturbance footprint for the BESS is negligible compared to other components, and paragliders and hang gliders are expected to be able to easily avoid landing within the fenced area of the BESS.

Operation of the BESS would result in negligible, long term, unlikely, local impacts on recreation resource use, experience, and public health and safety.

Substations

The five proposed substations would have common impacts during the operation stage. The impacts of the substations on recreation during the operation stage would be measurable and would affect recreational opportunities within the study area.

The substations and perimeter fencing would introduce vertical and geometric structures into the landscape. These features would contrast with the surrounding natural environment and would be visible from nearby recreation sites. Impacts from light and glare would be negligible. Visual impacts resulting from the operation of the substations are addressed in Section 4.10.

Operational noise levels would be similar to existing noise levels at most recreation sites due to the distances between the substations and most areas used for recreation. The primary ongoing noise sources at substations are the transformers, which generate sound generally described as a low humming. Circuit-breaker operations may also cause audible noise. Operational noise may be experienced by recreational users at the recreation areas that are closest to the Lease Boundary, such as Johnson Butte and the Horse Heaven Cemetery. Noise impacts resulting from operation of the substations are addressed in Section 4.11.

Operation of the substations is not expected to pose a risk to paragliders and hang gliders. The proposed disturbance footprint for the substations is negligible compared to other components, and paragliders and hang gliders are expected to be able to easily avoid landing within the fenced area of the substations.

Operation of the substations would have a small degree of impact on recreation sites and recreationists. Operation and maintenance activities are considered long term. Impacts on recreationists may occur beyond neighboring receptors. Activities during operation of the substations would result in negligible, long term, unlikely, local impacts on recreation resource use, experience, and public health and safety.

Comprehensive Project

The operation of the combined components would result in impacts on the safety of recreationists who paraglide and hang glide in the study area. Impacts related to visual resources could occur at recreation sites that give visitors potential unobstructed views of the Project's infrastructure. Operation of the Sellards Solar Field would remove access to an entire parcel of DNR-administered land.

The Project's potential to affect the health and safety of recreationists using the area for paragliding and hang gliding and limit access to recreation resources results in a medium impact. Operation of the comprehensive Project is long term. Impacts are unavoidable due to recreationists' views, safety, and activities being affected. Impacts on recreationists could occur beyond neighboring receptors. Activities during operation under the comprehensive Project would result in medium, long term, unavoidable, regional impacts on recreation resources, as follows:

- **Recreation – Use:** The comprehensive Project's potential to affect the use of public land near the Project during operation of the turbines and access to public land resulting from the operation of the Sellards Solar Field would result in a local, unavoidable, high, long term impact.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by the operation of the comprehensive Project could occur at nearby recreation sites, resulting in a regional, unavoidable, low, long term impact for the life of the Project.
- **Recreation – Public Health and Safety:** The comprehensive Project's potential to affect the health and safety of paragliders and hang gliders would result in a regional, medium, and unavoidable, long term impact for the life of the Project.

4.12.2.3 Impacts during Decommissioning

The Project's decommissioning stage may result in impacts on recreation.

It is anticipated that the Applicant would either repower the facility or decommission the Project following the operational life of the facility.

Decommissioning activities could limit access to recreational facilities or conflict with recreational uses. Decommissioning would be performed in accordance with the Washington Energy Facility Site Evaluation Council's (EFSEC) mandates and prior Site Certification Agreements and would include the dismantling and removing of aboveground components, including turbines, solar arrays, substations, BESS, and supporting infrastructure as well as belowground components to a depth of three feet below the surface.

Impacts related to construction of the two turbine options and other components are described below and are similar to those described for the construction stage of the Project. Impacts of the decommissioning of the comprehensive Project are described last.

Turbine Option 1

Impacts on recreation during the Project's decommissioning stage under Turbine Option 1 would be measurable and would affect recreational opportunities within the study area.

During decommissioning, workers may seek accommodation in RV parks or campgrounds. Existing limits on the length of stay in public camping areas would minimize any potential impacts on park users. Benton County may experience small increases in costs for park use and recreation due to related temporary increases in population.

Impacts from light would be negligible, while impacts from glare would be low during decommissioning of the Project. Visual effects resulting from the decommissioning of the turbines, including light and glare, are addressed in more detail in Section 4.10.

Noise related to decommissioning would be temporary and would be noticeable at recreation sites that are close to the Lease Boundary. Noise could affect the recreational experience of those engaged in the use of multi-use trails, hunting on public lands, fishing, or camping nearby. See Section 4.11 for a detailed analysis of noise generated during the decommissioning of turbines.

During Project decommissioning, traffic impacts would be similar to those evaluated for construction. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during decommissioning of the Project.

Decommissioning of turbines would reduce the risk to paragliders and hang gliders posed by both construction and operation of the Project; however, it is expected that the risk would remain until all turbines were removed. The main risks posed during decommissioning would be the loss of safe landing space in the event of an in-flight emergency requiring an unanticipated landing in an area containing the remaining infrastructure or turbines and supporting infrastructure being decommissioned with cranes.

Activities during decommissioning of the turbines would result in impacts on recreation resources, as follows:

- **Recreation – Use:** Decommissioning under Turbine Option 1 would limit recreational activities that occur on public land in areas near construction, resulting in a low, short term, and unavoidable impact on local recreation use.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by decommissioning under Turbine Option 1 could occur at nearby recreation sites, resulting in a short term, high, regional and unavoidable impact on recreational sites beyond neighboring receptors.

- **Recreation – Public Health and Safety:** Decommissioning under Turbine Option 1 would result in a regional, medium, unavoidable, short term impact mostly due to the impact on the public health and safety of paragliders and hang gliders.

Turbine Option 2

Impacts on recreation during the Project's decommissioning stage under Turbine Option 2 would be similar to those listed for Turbine Option 1, as follows:

- **Recreation – Use:** Decommissioning under Turbine Option 2 would limit recreational activities that occur on public land in areas near construction, resulting in a low, short term, and unavoidable impact on local recreation use.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by decommissioning under Turbine Option 2 could occur at nearby recreation sites, resulting in a short term, high, regional, and unavoidable impact on recreational sites beyond neighboring receptors.
- **Recreation – Public Health and Safety** Decommissioning under Turbine Option 2 would result in a regional, medium, unavoidable, short term impact mostly due to the impact on the public health and safety of paragliders and hang gliders.

Solar Arrays

The three proposed solar arrays would have common, measurable impacts on recreation during the decommissioning stage.

Depending on the location of a specific recreational resource, views of decommissioning activities may be fully or partially obstructed or viewers may have more wide-open views. Impacts from light and glare would be negligible. Visual effects resulting from decommissioning of the solar arrays are addressed in more detail in Section 4.10.

Noise related to decommissioning would be temporary and may be noticeable at recreation sites that are close to the Lease Boundary. Noise could affect the recreational experience of those engaged in hunting on public lands, fishing, or camping nearby. See Section 4.11 for a detailed analysis of noise generated during the decommissioning of the solar arrays.

Transportation-related impacts may occur on public roads used for existing recreational purposes during the decommissioning of solar arrays due to the transportation of materials. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during decommissioning.

Decommissioning of solar arrays would reduce the risk to paragliders and hang gliders posed by both construction and operation of the solar arrays, but the risk would remain until all solar arrays are removed. The main risks posed during decommissioning would be the loss of safe landing space in the event of an in-flight emergency requiring an unanticipated landing in an area containing remaining infrastructure or solar arrays and supporting infrastructure being decommissioned.

Activities during decommissioning of the solar arrays would result in impacts on recreation resources, as follows:

- **Recreation – Use:** The Project's potential to affect access to public land resulting from the decommissioning of the Sellards Solar Field would result in a limited, unavoidable, high, and short term impact.

- **Recreation – Recreational Experience:** Indirect impacts related to visual resources produced by the decommissioning of the solar arrays could occur at recreation sites resulting in a high and unavoidable impact on recreational sites regionally. Impacts would be for the duration of decommissioning, or short term.
- **Recreation – Public Health and Safety:** Decommissioning of the solar arrays would have the potential to affect the health and safety of paragliders and hang gliders resulting in a regional, medium, unavoidable, short term impact for the duration of decommissioning of the solar arrays.

Battery Energy Storage Systems

The three locations proposed for the construction of up to two BESS would have common, measurable impacts during the decommissioning stage.

Depending on the location of a specific recreational resource, views of decommissioning activities may be fully or partially obstructed or viewers may have more wide-open views. Impacts from light and glare would be negligible. Visual effects resulting from decommissioning of the BESS are addressed in more detail in Section 4.10.

Noise related to decommissioning would be temporary and may be noticeable at nearby recreation sites. Noise could affect the recreational experience of those engaged in hunting on public lands, fishing, or camping nearby. See Section 4.11 for a detailed analysis of noise generated during the decommissioning of the BESS.

No transportation-related impacts are expected for existing recreational uses during the decommissioning of BESS. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during operation.

The decommissioning of the BESS is not expected to pose a risk to paragliders and hang gliders. The proposed disturbance footprint for the BESS is negligible compared to other components, and paragliders and hang gliders are expected to be able to easily avoid landing within the fenced area of the BESS during decommissioning.

Decommissioning activities for BESS would result in negligible, temporary, feasible, local impacts on recreation resource use, experience, and public health and safety.

Substations

The five proposed substations would have common, measurable impacts on recreation during the decommissioning stage.

Depending on the location of a specific recreational resource, views of decommissioning activities may be fully or partially obstructed or viewers may have more wide-open views. Impacts from light and glare would be negligible. Visual effects resulting from decommissioning of the substations are addressed in more detail in Section 4.10.

Noise related to decommissioning would be temporary and may be noticeable at nearby recreation sites. Noise could affect the recreational experience of those engaged in hunting on public lands, fishing, or camping nearby. See Section 4.11 for a detailed analysis of noise generated during decommissioning of substations.

No transportation-related impacts are expected for existing recreational uses during decommissioning of substations since no road construction is required and decommissioning activities are unlikely to cause traffic delays. See Section 4.14 for a detailed analysis of traffic impacts and mitigation during operation.

The decommissioning of the substations is not expected to pose a risk to paragliders and hang gliders. The proposed disturbance footprint for the substations is negligible compared to other components, and paragliders and hang gliders are expected to be able to easily avoid landing within the fenced area of the substations during decommissioning.

Decommissioning activities for substations would result in negligible, temporary, feasible, local impacts on recreation resource use, experience, and public health and safety.

Comprehensive Project

The decommissioning of the Project's components would result in impacts on recreationists who paraglide and hang glide in the study area. Additionally, impacts related to visual resources and noise could occur at recreation sites. The decommissioning of the Project's components would also reduce the risk associated with construction and operation and maintenance stages.

Activities during the decommissioning of all components of the Project would result in impacts on recreation resources, as follows:

- **Recreation – Use:** The comprehensive Project's potential to affect the use of public land near the Project during the decommissioning of the turbines and access to public land resulting from the decommissioning of the Sellards Solar Field would result in a local, unavoidable, high, short term impact.
- **Recreation – Recreational Experience:** Indirect impacts related to visual resources and noise produced by decommissioning of the comprehensive Project could occur at nearby recreation sites, resulting in a regional, unavoidable, high, short term impact.
- **Recreation – Public Health and Safety:** The comprehensive Project's potential to affect the health and safety of paragliders and hang gliders would result in a regional, medium, short term, and unavoidable impact for the duration of decommissioning.

4.12.2.4 Summary of Impacts on Recreation Resources

The magnitude of impacts related to each recreational site within the study area is summarized in **Table 4.12-3**. The magnitude of impacts related to each recreational activity is summarized in **Table 4.12-4**.

Table 4.12-3: Summary of Impacts on Recreation Resources within the Study Area

Recreation Resource Name[a]	Recreation Activity Available[b]	Approximate Distance from Project (miles)[c]	Magnitude Impact of Turbine Option 1 and Turbine Option 2 (Summarized from Magnitude Ratings Described in Sections 4.10, 4.11, and 4.14)		
			Visual Impacts During Operation[d]	Noise and Vibration Impacts During Operation[e]	Transportation Impacts During Construction[f]
County and Regional Resources and Activities					
Badger Mountain Centennial Preserve	Hiking, Wildlife Viewing, Scenic View	4	High	Negligible	Low
Boardman Parks and Recreation District	Boating, Playground, Swimming, Hiking, Camping	20.1	N/A	Negligible	Negligible
Candy Mountain Preserve	Hiking, Biking, Scenic View	5	N/A	Negligible	Low
Horn Rapids Park	Camping, Hiking, Scenic View	9	N/A	Negligible	Negligible
Horse Heaven Cemetery	Hiking, Scenic View	0	N/A	Medium	Medium
Horse Heaven Vista	Hiking, Biking, Scenic View	7	N/A	Negligible	Negligible
Hover Park	Hiking, Scenic View, Biking, Wildlife Viewing, Fishing	1.5	N/A	Low	Low
Rattlesnake Mountain Shooting Facility	Shooting Range	8	N/A	Negligible	Negligible
Two Rivers Park	Playground, Swimming, Boating, Hiking, Golfing	4.5	N/A	Negligible	Low
Vista Park	Playground, Scenic View	5	N/A	Negligible	Low
Wallula Gap Preserve	Hiking, Scenic View	3	N/A	Low	Medium
State of Washington and Oregon Resources and Activities					
Chandler Butte	Hiking, Paragliding, Scenic View	1.8	High	Low	Medium
Coyote Springs Wildlife Area	Scenic View, Camping, Wildlife Viewing, Hunting	21	N/A	Negligible	Negligible
Goose Hill Butte	Hiking, Paragliding, Scenic View	2	N/A	Low	Medium
Hat Rock State Park	Playground, Boating, Fishing, Scenic View, Wildlife Viewing, Hiking	8.1	N/A	Negligible	Negligible
Irrigon Wildlife Area	Camping, Scenic View, Hunting, Fishing, Wildlife Viewing	11	N/A	Negligible	Negligible
Johnson Butte	Hiking, Paragliding, Scenic View	0	N/A	Medium	Medium
Jump Off Joe Butte	Hiking, Paragliding, Scenic View	1.5	N/A	Low	Medium
Sacajawea Historical State Park	Hiking, Scenic View	5.2	N/A	Negligible	Low
Federal Resources and Activities					
Charbonneau Park	Boating, Fishing, Swimming, Camping	12.5	N/A	Negligible	Negligible
Cold Springs National Wildlife Refuge	Hunting, Fishing, Wildlife Viewing, Hiking	11.3	N/A	Negligible	Negligible
Crow Butte Park	Boating, Fishing, Swimming, Camping	22.2	N/A	Negligible	Negligible
Fishhook Park	Boating, Fishing, Swimming, Camping, Hunting	18.5	N/A	Negligible	Negligible
Hanford Reach National Monument	Hunting, Fishing, Wildlife Viewing, Hiking	14.3	N/A	Negligible	Negligible
Hood Park	Boating, Fishing, Swimming, Camping	6.5	N/A	Negligible	Low
Irrigon Fish Hatchery	Hunting, Fishing, Wildlife Viewing, Hiking	13.9	N/A	Negligible	Negligible
Juniper Dunes OHV Area / ACEC Wilderness Area	OHV Area	15.3	N/A	Negligible	Negligible
McBee Trailhead (Horse Heaven Hills)	Hiking, Biking, Paragliding	1.5	High	Low	Medium
McNary National Wildlife Refuge	Hunting, Fishing, Wildlife Viewing, Hiking	2.7	Medium	Low	Low
Saddle Mountain National Wildlife Refuge	Hunting, Fishing, Wildlife Viewing, Hiking	8.7	N/A	Negligible	Negligible
Sand Station Recreation Area (Lake Wallula)	Boating, Fishing, Swimming, Camping	8	N/A	Negligible	Negligible
Sunnyside Wildlife Management Area	Hunting, Fishing, Wildlife Viewing, Hiking	15	N/A	Negligible	Negligible
Umatilla National Wildlife Refuge	Hunting, Fishing, Wildlife Viewing, Hiking	11.4	N/A	Negligible	Negligible
Washington Farm Service Agency Tracts	Hunting, Fishing, Wildlife Viewing, Hiking	24.7	N/A	Negligible	Negligible

Notes:

(a) There are 208 small local parks found within the study area. These various parks are shown in Figures 3.12-1 through 3.12-4 but are not listed individually in this table.

(b) = Biking; = Boating; = Camping; = Fishing; = Golfing; = Hiking; = Hunting on public lands; = OHV Area; = Paragliding; = Playground/Recreational Equipment; = Scenic View or Visual Attraction including Sites with Historical Significance; = Shooting Range; = Swimming; = Wildlife Viewing and Bird Watching

(c) Horse Heaven Wind Farm, LLC 2022

(d) Impacts related to visual setting (including light and glare) are addressed in Section 4.10. Magnitude is provided for what was analyzed during operation.

(e) Impacts related to noise and vibration are addressed in Section 4.11. Magnitude is provided for what was analyzed during operation.

(f) Impacts related to traffic are addressed in Section 4.14. Magnitude is provided for what was analyzed during construction.

ACEC = Area of Critical Environmental Concern; BLM = Bureau of Land Management; Const. = Construction; Decom = Decommissioning; N/A – Not Analyzed due to lack of key observation point; NPS = National Park Service; O&M = Operation and Maintenance; OHV = off-highway vehicle

Table 4.12-4: Impacts from Turbine Option 1 and Turbine Option 2 on Recreation Resources within the Study Area by Resource Activity

Recreation Resource Type	Magnitude Impact of Turbine Option 1 and Turbine Option 2 (Summarized from Magnitude Ratings Described in Sections 4.10, 4.11, and 4.14)		
	Visual Impacts During Operation[(a)]	Noise Impacts During Operation[(b)]	Transportation Impacts During Construction[(c)]
Biking	High	Low	Medium
Boating	N/A	Negligible	Low
Camping	N/A	Negligible	Low
Fishing	N/A	Low	Low
Golfing	N/A	Negligible	Low
Hiking	High	Medium	Medium
Hunting on Public Lands	Medium	Low	Low
OHV	N/A	Negligible	Negligible
Paragliding	High	Low	Medium
Parks with Playground/Recreational Equipment	N/A	Negligible	Low
Scenic View or Visual Attraction including Sites with Historical Significance	High	Medium	Medium
Shooting Range	N/A	Negligible	Negligible
Wildlife Viewing and Bird Watching	High	Low	Low

Notes:
[(a)] Impacts related to visual setting (including light and glare) are addressed in Section 4.10. Magnitude is provided for what was analyzed during operation.
[(b)] Impacts related to noise and vibration are addressed in Section 4.11. Magnitude is provided for what was analyzed during operation.
[(c)] Impacts related to traffic are addressed in Section 4.14. Magnitude is provided for what was analyzed during construction.
N/A – Not Analyzed due to lack of key observation point; OHV = off-highway vehicle

4.12.2.5 Recommended Mitigation Measures

This section describes measures that would reduce or compensate for impacts related to recreation from construction, operation, and decommissioning of the Project. It is important to note that the full suite of mitigation measures and monitoring actions would not be known until many or most of the required permits have been issued, which often contain required measures intended to avoid or reduce environmental effects. The following measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action:

R-1[57]**:** The Certificate Holder would coordinate with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within the Lease Boundary (e.g., multi-use trails).

Rationale: To mitigate the potential loss of recreational activities due to the Project.

R-2: The Certificate Holder would provide a minimum of five informational boards approved by DNR and EFSEC at viewpoints within the Lease Boundary and/or in the surrounding communities associated with

[57] R-: Identifier of numbered mitigation item for Recreation

scenic areas of interest. The construction of the informational boards would be completed within five years of the beginning of construction.

Rationale: To mitigate the loss of uninterrupted views of scenic viewpoints and provide information to the public regarding the Project, the Project's expected years of operation and the reclamation of the Project. Additionally, photographs of the viewshed prior to the construction of the Project should be displayed, in color, on the informational boards.

R-3: The Certificate Holder would coordinate with local and regional (when appropriate) recreation groups (e.g., the Northwest Paragliding Club, the Tri-City Bicycle Club) to develop and maintain an adaptive safety management plan, prior to construction and approved by EFSEC, to continue access to recreation activities in the Project area while keeping recreation enthusiasts safe. This plan should identify potential hazards within the Project Area (e.g., construction on or near common bicycle paths, Project-created no fly zones for recreation activities, etc.) and provide opportunities to identify or improve other similar recreation use areas to offset any recreation removed from the Project area as a result of the Project. Specific to paragliding, the Certificate Holder would perform outreach to other regional paragliding entities to share the safety management plan to ensure that recreationists are aware of the limitations the Project creates for safe landing and safe air space.

Rationale: To mitigate the loss of safe use for recreation enthusiasts.

4.12.2.6 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and includes the undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[58]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for recreation in the Draft EIS, and the impact ratings remain the same.

4.12.2.7 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

[58] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

This EIS weighs the potential impacts on recreation that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact, as listed in **Tables 4.12-5a, 4.12-5b, and 4.12-5c**. As shown in the impact summary tables for recreation resources, EFSEC has determined that significant unavoidable adverse impacts would occur during the operation stage.

Table 4.12-5a: Summary of Potential Impacts on Recreation during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Recreation – Use	Turbine Option 1 Turbine Option 2	Installation of the turbines would limit recreational activities that occur on public land in areas near construction, as well as impede cyclists' use of established routes during the transportation of equipment and materials.	Medium	Short Term	Unavoidable	Local	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails)	None identified
Recreation – Use	Solar Arrays	Construction of the Sellards Solar Field would restrict access to a parcel of DNR-administered land within the Lease Boundary resulting in a high impact.	High	Long Term	Unavoidable	Limited	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails)	None identified
Recreation – Use	BESS Substations	Construction of the BESS and Substations would cause a negligible impact on recreationists.	Negligible	Temporary	Feasible	Local	No mitigation identified	None identified
Recreation – Use	**Comprehensive Project**	Construction of the comprehensive Project would result in a high impact due to the restriction of access to public land and recreational activities that occur on public land within the Project's construction area. The impact would be long term for the duration of the life of the Project, unavoidable, and local.	High	Long Term	Unavoidable	Local	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails) **R-2:** Provide informational boards, as approved by DNR and EFSEC, at viewpoints associated with scenic areas of interest **R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	None identified
Recreation – Recreational Experience	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Indirect impacts related to visual resources and noise could occur at recreation sites.	High	Long Term	Unavoidable	Regional	**R-2:** Provide informational boards, as approved by DNR and EFSEC, at viewpoints associated with scenic areas of interest.	None identified
Recreation – Recreational Experience	BESS Substations	Construction of the BESS and Substations would cause a negligible impact on recreationists.	Negligible	Temporary	Feasible	Local	No mitigation identified	None identified
Recreation – Public Health and Safety	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	The Project's potential to affect the health and safety of recreationists using the area for paragliding, hang gliding, or biking would result in a medium impact.	Medium	Long Term	Unavoidable	Regional	**R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	None identified

Table 4.12-5a: Summary of Potential Impacts on Recreation during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Recreation – Public Health and Safety	BESS Substations	Construction of the BESS and Substations would cause a negligible impact on recreationists.	Negligible	Temporary	Feasible	Local	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; DNR = Washington Department of Natural Resources; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.12-5b: Summary of Potential Impacts on Recreation during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Recreation – Use	Turbine Option 1 Turbine Option 2	Turbines would limit recreational activities (i.e., paragliding) that occur on public land near areas of operation.	Low	Long Term	Unavoidable	Local	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails)	None identified
Recreation – Use	Solar Arrays	Operation of the Sellards Solar Field would restrict access to a parcel of DNR-administered land within the Lease Boundary.	High	Long Term	Unavoidable	Limited	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails)	None identified
Recreation – Use	BESS Substations	Operation of the BESS and substations would cause a negligible impact on recreationists.	Negligible	Long Term	Unlikely	Local	No mitigation identified	None identified
Recreation – Use	**Comprehensive Project**	Operation of the comprehensive Project would result in a high impact due to the restriction of access to public land and recreational activities that occur on public land near the Project. The impact would be long term for the duration of the life of the Project, unavoidable, and local.	High	Long Term	Unavoidable	Local	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails) **R-2:** Provide informational boards, as approved by DNR and EFSEC, at viewpoints associated with scenic areas of interest **R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	None identified
Recreation – Recreational Experience	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Impacts on noise receptors would be limited, while visual impacts would occur regionally.	Low	Long Term	Unavoidable	Regional	**R-2:** Provide informational boards, as approved by DNR and EFSEC, at viewpoints associated with scenic areas of interest	None identified
Recreation – Recreational Experience	BESS Substations	Operation of the BESS and substations would cause a negligible impact on recreationists.	Negligible	Long Term	Unlikely	Local	No mitigation identified	None identified
Recreation – Public Health and Safety	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	The Project's potential to affect the health and safety of recreationists using the area for paragliding and hang gliding would results in a medium impact during the life of the Project. Impacts on recreationists would occur beyond neighboring receptors.	Medium	Long Term	Unavoidable	Regional	**R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	Significant for paragliding and hang gliding public health and safety

Table 4.12-5b: Summary of Potential Impacts on Recreation during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Recreation – Public Health and Safety	BESS Substations	Operation of the BESS and substations would cause a negligible impact on recreationists.	Negligible	Long Term	Unlikely	Local	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; DNR = Washington Department of Natural Resources; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.12-5c: Summary of Potential Impacts on Recreation during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Recreation – Use	Turbine Option 1 Turbine Option 2	Decommissioning would result in impacts on recreationists who use the Project's study area for recreational activities. Paragliders, hang gliders, and cyclists would be affected by the decommissioning of the Project.	Low	Short Term	Unavoidable	Local	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails) **R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	None identified
Recreation – Use	Solar Arrays	Decommissioning of the Sellards Solar Field would restrict access to a parcel of DNR-administered land within the Lease Boundary, resulting in a high impact.	High	Short Term	Unavoidable	Limited	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails)	None identified
Recreation – Use	BESS Substations	Decommissioning of the BESS and substations would cause a negligible impact on recreationists.	Negligible	Temporary	Feasible	Local	No mitigation identified	None identified
Recreation – Use	**Comprehensive Project**	Decommissioning of the comprehensive Project would result in a high impact due to the restriction of access to public land and recreational activities that occur on public land near the Project. The impact would be short term for the duration of decommissioning, unavoidable, and local.	High	Short Term	Unavoidable	Local	**R-1:** Work with DNR and Benton County to identify new recreational activities and/or improve existing recreational activities within Lease Boundary (e.g., multi-use trails) **R-2:** Provide informational boards, as approved by DNR and EFSEC, at viewpoints associated with scenic areas of interest **R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	None identified
Recreation – Recreational Experience	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Indirect impacts related to visual resources and noise could occur at recreation sites. Impacts on noise receptors would occur locally, while visual impacts would occur at a regional spatial extent.	High	Short Term	Unavoidable	Regional	**R-2:** Provide informational boards, as approved by DNR and EFSEC, at viewpoints associated with scenic areas of interest	None identified
Recreation – Recreational Experience	BESS Substations	Construction of the BESS and substations would cause a negligible impact on recreationists.	Negligible	Temporary	Feasible	Local	No mitigation identified	None identified
Recreation – Public Health and Safety	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	The Project's potential to affect the health and safety of recreationists using the area for paragliding, hang gliding, or biking would result in a medium impact.	Medium	Short Term	Unavoidable	Regional	**R-3:** Work with the local and regional clubs to provide and maintain a plan to keep recreationalists safe	None identified

Table 4.12-5c: Summary of Potential Impacts on Recreation during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: • Negligible • Low • Medium • High	Duration of Impact: • Temporary • Short Term • Long Term • Constant	Likelihood of Impact: • Unlikely • Feasible • Probable • Unavoidable	Spatial Extent or Setting of Impact: • Limited • Confined • Local • Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Recreation – Public Health and Safety	BESS Substations	Construction of the BESS and substations would cause a negligible impact on recreationists.	Negligible	Temporary	Feasible	Local	No mitigation identified	None identified

Notes:
[a] The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 for details.
[d] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; DNR = Washington Department of Natural Resources; EFSEC = Washington Energy Facility Site Evaluation Council

4.12.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related recreation from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.13 Public Health and Safety

This section describes potential impacts on public health and safety from the proposed Horse Heaven Wind Farm (Project, or Proposed Action) or under the No Action Alternative. Agencies and medical facilities providing public health and safety services (e.g., law enforcement, fire protection, and medical emergency services) within the vicinity of the Project Lease Boundary are identified in Section 3.13. As referenced in Section 3.13, Benton County Emergency Services is made up of two divisions: the Southeast Communications Center and Benton County Emergency Management. The two divisions assist emergency responders and promote community safety by coordinating incident response. Section 4.12 Recreation presents an analysis of recreational safety within the Project vicinity and Lease Boundary.

Sections 3.11 and 4.11 of this Environmental Impact Statement (EIS) describe existing conditions and potential impacts related to noise. Radiation levels are not applicable to the Project or the No Action Alternative and are therefore not discussed in this EIS.

Security measures to limit public access to Project components during construction, operation, and decommissioning are described in Section 2.19 of the Application for Site Certification (ASC) and include temporary (safety) fencing, permanent fencing, warning signs, and locks on equipment and Project facilities (Horse Heaven Wind Farm, LLC 2022). The Washington Energy Facility Site Evaluation Council (EFSEC) considers these measures sufficient to prevent injury to the public from the Project and therefore focuses the impact assessment in Sections 4.13.2 and 4.13.3 on risks and impacts associated with fires, explosions, or potential releases of hazardous materials to the environment within the vicinity of the Project Lease Boundary.

Section 3.13 describes the network of available public services, including emergency management, law enforcement, fire protection, and health services (hospitals and health care facilities) that would respond to public health and safety emergencies. The available systems are extensive and could respond to fires, explosions, or potential releases of hazardous materials to the environment within the vicinity of the Project Lease Boundary (unless noted otherwise in this section).

4.13.1 Method of Analysis

In accordance with the Washington State Environmental Policy Act (SEPA), this EIS weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when determining the significance of identified potential impacts (WAC 197-11-330 and WAC 197-11-794). The impact rating is summarized in **Table 4.13-1**.

Table 4.13-1: Impact Rating Table for Public Health and Safety from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Table 4.13-2 defines the qualitative framework used herein to rank the magnitude of impact and presents impact magnitude with respect to public health and safety services.

Table 4.13-2: Criteria for Assessing Magnitude of Impacts on Public Health and Safety

Magnitude of Impacts	Description
Negligible	**Smoke and haze:** No risk of smoke or haze from accidental fire. **Hazardous materials release:** A release of hazardous materials would not be possible. **Emergency services:** Response times of emergency services would remain unchanged.
Low	**Smoke and haze:** Smoke and haze may occur, but any accidental fire would be easily contained and not pose a health or safety concern. **Hazardous materials release:** Hazardous materials may be used or stored on site, but in small quantities that could be easily contained. **Emergency services:** Emergency response times would not be altered to a status that would have an effect on community health and safety or on-site personnel.

Table 4.13-2: Criteria for Assessing Magnitude of Impacts on Public Health and Safety

Magnitude of Impacts	Description
Medium	**Smoke and haze:** Smoke and haze generated by accidental fires could be measurably increased and may affect public health. Moderate amounts of combustible materials may be used or stored on site. **Hazardous materials release:** Hazardous materials may be used or stored on site, in quantities that could pose a health risk if a release were to occur. **Emergency services:** Emergency response times could be altered to a level that would affect the local community or safety of on-site personnel.
High	**Smoke and haze:** Smoke and haze from accidental fire would measurably affect public health. Large amounts of combustible materials may be used or stored on site. **Hazardous materials release:** Hazardous materials would be used or stored on site, in quantities that would pose a severe health risk if a release were to occur. **Emergency services:** Emergency response times could be altered to a level that would severely affect the local community or safety of on-site personnel

Applicant Commitments

Horse Heaven Wind Farm, LLC (Applicant) has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on public health and safety are discussed in Section 2.1.3 of the EIS and 4.1.2 of the 2022 ASC and summarized below.

The Applicant and its contractors would comply with applicable federal, state, and local health and safety standards, including:

- Occupational Safety and Health Act of 2000
- Applicable Standards from WAC 296-155, Safety Standards for Construction Work
- International Building Code
- National Fire Protection Association Standards
- National Institute for Occupational Safety and Health
- American Society of Mechanical Engineers, design standards
- American National Standards Institute, design standards
- National Electric Safety Code
- American Concrete Institute Standards
- Institute of Electrical and Electronics Engineering Guide for Substation Fire Protection (979-2012)
- Unified Facilities Criteria (UFC) for Fire Protection Engineering for Facilities (UFC 3-600-01)

During construction of the Project, trees and vegetation that pose a hazard to the collector lines may be topped or cleared[59] from the right-of-way. During operation and maintenance, vegetation that is overgrown and could pose a hazard to the transmission line would be topped or cleared on an as-needed basis. battery energy storage systems (BESS) and diesel-powered generators would include fire suppression measures. Appropriate coordination with local emergency personnel would be conducted. Precautionary measures would be taken during construction to reduce fire risk. Construction equipment would be monitored where activities may present safety issues.

The Applicant has identified multiple actions to prevent or respond to spills (Section 2.10 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022).

The Applicant would coordinate with local emergency services personnel (Section 3.13) and provide training to them where necessary. The Applicant would prepare and submit the following emergency plans to EFSEC for approval prior to construction (unless otherwise noted):

- Emergency Action Plan
- Safety Manual
- Spill Prevention, Control, and Countermeasures (SPCC) Plan (Construction)
- SPCC Plan (Operations, to be submitted prior to operations)
- Stormwater Pollution Prevention Plan (Construction)

The construction contractor would be responsible for implementing the applicable plans during construction.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.13.2.5, Post-Adjudication Applicant Commitments.

4.13.2 Impacts of the Project

4.13.2.1 Impacts during Construction

The Project's construction stage could result in the risk of fire or spills of fuels or lubricants from construction equipment (Section 4.1.2 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022). Fires may occur as a result of the fuel combustion process associated with construction equipment or generators used on site. Vegetation could pose a fire risk if allowed to grow into the clearance area of power line conductors. The Project would be situated on vacant land with dryland vegetation cover and few trees. The risk of fire would be higher in summer and fall than in winter and spring. The Applicant commitments to mitigate fire risk and impacts are discussed in Section 4.13.1. above.

The Lease Boundary is dominated by rolling hills bisected by meandering canyons, some of which constitute ephemeral or intermittent drainages. During construction, small quantities of a few hazardous materials (e.g.,

[59] As referenced in Section 4.5 Vegetation, Recommended Mitigation Measures Veg-1 states that trees cannot be removed without pre-approval. Where tree disturbance cannot be avoided by the Project (e.g., near transmission lines), the number and location of the trees would be provided to EFSEC, along with a statement justifying why avoidance cannot be achieved and a mitigation plan.

cleaners, insecticides or herbicides, paint, or solvents) may be utilized in the construction yards. These materials would be stored in a secure location within the construction yards when not in use.

The Applicant anticipates that up to 500 gallons of diesel fuel and 200 gallons of gasoline may be kept on site during construction for fueling of equipment. Fuels would be stored in temporary aboveground tanks in the construction yard(s), within an area providing secondary containment. Only small quantities of other hazardous materials would be stored or used during construction. All hazardous chemicals would be stored in a manner that provides secondary containment.

In addition, up to three diesel-powered generators may be required during turbine commissioning. Each generator can hold up to 1,250 gallons of fuel in a tank within a secondary containment system. Supplementing the generator tanks, a 3,000-gallon diesel fuel tank with its own secondary containment system may be on site during turbine commissioning (approximately 19 weeks total) to minimize the need for refueling deliveries.

Most fuel would be delivered to the construction yard by a licensed specialized tanker vehicle on an as-needed basis. Only small quantities of lubricating oils, hydraulic fluid for construction equipment, or other hazardous materials would be maintained on site during construction. Lubricating oil or hydraulic fluids for construction equipment would similarly be brought in as needed for equipment maintenance by a licensed contractor using a specialized vehicle, and waste oils removed by a similarly licensed maintenance contractor. Hydraulic oils for the turbines and dielectric oils for the transformers would also be brought in on an as needed basis and be transferred into the receiving components; none would be stored on site.

Historic and current agricultural practices within the Lease Boundary have likely introduced herbicides and pesticides to the environment. When these soils are exposed to winds and ground disturbance, airborne dust can be transported to nearby lands. Herbicides and pesticides attached to dust particles could, therefore, also be transported away from the Lease Boundary. During construction, earthwork could suspend dust, herbicides, and pesticides, which could be transported by winds. Human exposure to these elements may impact public health. However, given the current agricultural practices, such as tilling and fallow practices, the suspension of dust attached to pesticides and herbicides is occurring under existing conditions. Given that the overall footprint of earthwork related to the Project would be much less extensive than that of agricultural practices in the area, no impacts are expected. Further, the Applicant’s use of dust suppression measures would minimize the likelihood of this occurrence.

In the unlikely event of an accidental hazardous material release, the contaminated material or soils would be cleaned up, disposed of, and treated according to applicable regulations. Spill kits containing items such as absorbent pads would be located on equipment and in on-site temporary storage facilities to respond to accidental spills if any were to occur. Employees handling hazardous materials would be instructed in the proper handling and storage of these materials and the locations of spill kits. Further Applicant commitments to reduce the potential for impacts related to hazardous materials releases are described in Section 4.13.1.

Turbine Option 1

Risks related to public health and safety from turbine construction under Turbine Option 1 include the general risks associated with construction equipment and use described above, as well as the following risks specific to turbines:

- Turbines may pose a fire risk due to the combustible materials and lubricants contained in the nacelles.

- Diesel-powered generators that may be used during initial turbine commissioning could pose a fire risk due to the fuel combustion process.

Fire may result from turbine construction under Turbine Option 1 due to existing site conditions and the nature of construction activities. However, potential impacts related to fire could be meaningful, as wildfire risk in the area is considered high (Section 3.13.2.1). Impacts of a fire would be medium, temporary, feasible, and limited in spatial extent. Both emergency responders and residents within and near the Lease Boundary would experience direct impacts (Section 3.13). One of the two fire districts servicing the Lease Boundary is reliant on neighboring fire agencies for structure firefighting (Section 3.13), so suppression of fire in a turbine tower could be delayed. Indirect impacts of fire on members of the public at a distance from the Lease Boundary (e.g., in the Tri-Cities area) could include smoke or haze and a potential reduction in the availability of emergency responders. These impacts would be medium, temporary, feasible, and regional in spatial extent.

Impacts from turbine construction under Turbine Option 1 associated with releases to the environment that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts (few are located near the Wind Energy Micrositing Corridor, where the turbines would be located). Indirect impacts associated with releases to the environment are not expected.

Turbine Option 2

The lower number of turbines under Turbine Option 2 (up to 150 turbines) poses a lower fire risk than Turbine Option 1 (up to 244 turbines). However, public health and safety impacts resulting from fire under Turbine Option 2 would be the same as Turbine Option 1 (medium in severity, but temporary, feasible, and limited in spatial extent). Indirect impacts of fire on members of the public at a distance from the Lease Boundary (e.g., in the Tri-Cities area) could include smoke or haze and a potential reduction in the availability of emergency responders. These impacts would be medium, temporary, feasible, and regional in spatial extent.

The lower number of turbines under Turbine Option 2 (up to 150 turbines) poses a lower risk of spills than Turbine Option 1 (up to 244 turbines). However, the impacts on public health and safety resulting from releases of hazardous materials under Turbine Option 2 would not be different from Turbine Option 1 (medium in severity but temporary, unlikely, and limited in spatial extent). Indirect impacts associated with releases to the environment are not expected.

Solar Arrays

Risks related to public health and safety from solar array construction include the general risks of construction equipment and use. A fire resulting from solar array construction would be medium in severity, temporary, unlikely, and limited in spatial extent. However, potential impacts related to fire could be meaningful, as wildfire risk in the area is considered high (Section 3.13.2.1). Indirect impacts of fire on members of the public at a distance from the Lease Boundary (e.g., in the Tri-Cities area) could include smoke or haze and a potential reduction in the availability of emergency responders. These impacts would be medium, temporary, unlikely, and regional in spatial extent.

There is little risk of a hazardous material release to the environment from solar arrays; inverter station transformers contained within solar arrays include small amounts of oil. Impacts associated with releases to the environment from solar array construction that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts

(Section 3.13), but residents are not expected to experience direct impacts; few residents are located immediately adjacent to each proposed solar array location. Indirect impacts associated with releases to the environment are not expected.

Battery Energy Storage Systems

Risks related to public health and safety from BESS construction would include the general risks associated with construction equipment and use and the following risks specific to BESS:

- Lithium-ion battery storage may pose a risk of fire and explosion due to the tendency for lithium-ion batteries to overheat (flammable electrolyte products can vaporize, vent from cells, and ignite on contact with an ignition source).
- Lithium-ion batteries and lead-acid batteries contain hazardous materials, which could pose a potential for release to the environment if handled improperly.

A fire resulting from BESS construction would be medium in severity, temporary, unlikely, and limited in spatial extent. However, the potential impacts related to fire could be meaningful, as wildfire risk in the area is considered high (Section 3.13.2.1). Indirect impacts of fire on members of the public at a distance from the Lease Boundary (e.g., in the Tri-Cities area) could include smoke or haze and a potential reduction in the availability of emergency responders. These impacts would be medium, temporary, unlikely, and regional in spatial extent.

Impacts associated with releases to the environment from BESS construction that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts; few to no residents are located immediately adjacent to each BESS, depending on its specific location. Indirect impacts associated with releases to the environment are not expected.

Substations

Risks from substation construction related to public health and safety include the general risks of construction equipment and use. A fire resulting from substation construction would be medium in severity, temporary, unlikely, and limited in spatial extent. However, the potential impacts related to fire could be meaningful, as wildfire risk in the area is considered high (Section 3.13.2.1). Indirect impacts of fire on members of the public at a distance from the Lease Boundary (e.g., in the Tri-Cities area) could include smoke or haze and a potential reduction in the availability of emergency responders. These impacts would be medium, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from substations; transformers in each substation contain small amounts of oil. Impacts associated with releases to the environment from substation construction that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts; few to no residents are located immediately adjacent to each substation, depending on its specific location. Indirect impacts associated with releases to the environment are not expected.

Comprehensive Project

Construction of the Project as a whole could result in both direct and indirect impacts on public health and safety. Direct impacts related to fire would be medium in severity but temporary, feasible, and limited in spatial extent.

Indirect impacts related to fire, including smoke, haze, and potential for reduced availability of emergency responders, would also be medium in severity, temporary, and feasible, but regional in spatial extent.

Impacts associated with releases to the environment from Project construction that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders could experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts; few residents are located near the Micrositing Corridor, where the turbines would be located, or to the other Project components. Indirect impacts associated with releases to the environment are not expected.

4.13.2.2 Impacts during Operation

Turbine Option 1

Direct and indirect impacts on public health and safety resulting from turbine operation under Turbine Option 1 would be similar to those described for construction under Turbine Option 1, although with a lower rating for likelihood. Spontaneous fire or explosions from operating wind turbines are rare, although not unheard of; one study estimated one fire per year for every 19,230 turbines operating worldwide (Carbon Brief 2014). There are approximately 2,000 wind turbines in Washington State (Hoen et al. 2018). A fire that burned approximately 250 acres in Klickitat County, Washington, occurred in 2019 when a wind turbine's generator caught fire, causing sections of the turbine to melt and then fall to the ground (Carter 2019). Direct impacts on public health and safety would be low in severity and temporary, unlikely, and limited in spatial extent. One of the two fire districts servicing the Lease Boundary is reliant on neighboring fire agencies for structure firefighting (Section 3.13), so fire suppression at a turbine tower could be delayed. Indirect impacts from smoke or haze would be low in severity, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from turbine operation under Turbine Option 1; turbine gearboxes contain small amounts of oil and lubricants that are unlikely to be released outside the turbine during maintenance. The Applicant has identified multiple actions to prevent or respond to spills (Section 2.10 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022). Releases to the environment from turbine operation would be negligible, temporary, unlikely, and limited in spatial extent.

Turbine Option 2

Direct and indirect impacts on public health and safety resulting from turbine operation under Turbine Option 2 would be similar to those described for Turbine Option 2 construction, with a lower rating for likelihood. Although the lower number of turbines under Turbine Option 2 (up to 150 turbines) compared to Turbine Option 1 (up to 244 turbines) poses an inherently lower risk of occurrence of fire, direct impacts on public health and safety from turbine operation under Turbine Option 2 would be low in severity but temporary, unlikely, and limited in spatial extent. Indirect impacts from smoke or haze would be low in severity, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from turbine operation under Turbine Option 2; turbine gearboxes contain small amounts of oil and lubricants that are unlikely to be released outside the turbine during maintenance. The Applicant has identified multiple actions to prevent or respond to spills (Section 2.10 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022). Releases to the environment from turbine operation would be negligible, temporary, unlikely, and limited in spatial extent.

Solar Arrays

There is no expectation of risk from fire associated with operation of solar arrays. There is little risk of hazardous material release to the environment from solar arrays; inverter station transformers contained within solar arrays include small amounts of oil that could be released if not properly maintained. The Applicant has identified multiple actions to prevent or respond to spills (Section 2.10 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022). Fire or releases to the environment from solar array operation are not expected to impact public health and safety. These impacts would be negligible, temporary, unlikely, and limited in spatial extent.

Battery Energy Storage Systems

Direct and indirect impacts on public health and safety resulting from BESS operation would be similar to those described for BESS construction. A fire resulting from BESS operation would be medium, temporary, feasible, and limited in spatial extent. The potential impacts related to fire could be meaningful, as wildfire risk in the area is considered high (Section 3.12.2.1). Indirect impacts of fire on the public at a distance from the Lease Boundary (e.g., in the Tri-Cities area) could include smoke or haze and a potential reduction in availability of emergency responders. These impacts would be low, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from BESS; lithium-ion batteries and lead-acid batteries contain hazardous materials that could pose the potential for release to the environment if not properly maintained. The Applicant has identified multiple actions to prevent or respond to spills (Section 2.10 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022). Releases to the environment from BESS operation are not expected to impact public health and safety. These impacts would be negligible, temporary, unlikely, and limited in spatial extent.

Substations

There is a minimal expectation of risk from fire or explosion associated with substation transformers during Project operation. The Applicant's commitments to mitigate fire risk and impacts are discussed in Section 4.13.2.4. Direct impacts on public health and safety would be medium in severity and temporary, feasible, and limited in spatial extent. Indirect impacts from smoke or haze would be low, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from substations; transformers contain small amounts of oil that may be released if not properly maintained. The Applicant has identified multiple actions to prevent or respond to spills (Section 2.10 of the 2022 ASC) (Horse Heaven Wind Farm, LLC 2022). Fire or releases to the environment from substation operation are not expected to impact public health and safety. These impacts would be negligible, temporary, unlikely, and limited in spatial extent.

Comprehensive Project

Operation of the Project as a whole could result in both direct and indirect impacts on public health and safety, though these impacts are unlikely. Direct impacts on public health and safety from fire could be low to medium in severity and temporary, feasible, and limited in spatial extent. Indirect impacts from smoke or haze would be low in severity, temporary, unlikely, and regional in spatial extent. Releases to the environment from operation of the Project are not expected to impact public health and safety. These impacts would be negligible, temporary, unlikely, and limited in spatial extent.

4.13.2.3 Impacts during Decommissioning

Turbine Option 1

Direct and indirect impacts on public health and safety during decommissioning of turbines under Turbine Option 1 would be similar to those described for construction under Turbine Option 1. Direct impacts related to fire would be medium in severity, and temporary, feasible, and limited in spatial extent. Indirect impacts related to smoke and haze would also be medium, temporary, and feasible, but regional in spatial extent.

Impacts associated with releases to the environment that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts (few residents are located near the Micrositing Corridor, where the turbines would be located). Indirect impacts associated with releases to the environment are not expected.

Turbine Option 2

Direct and indirect impacts on public health and safety during decommissioning of turbines under Turbine Option 2 would be similar to those described for construction under Turbine Option 2. Direct impacts related to fire would be medium in severity, and temporary, feasible, and limited in spatial extent. Indirect impacts related to smoke and haze would also be medium, temporary, and feasible, but regional in spatial extent.

Impacts associated with releases to the environment that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts (few residents are located near the Micrositing Corridor, where the turbines would be located). Indirect impacts associated with releases to the environment are not expected.

Solar Arrays

Direct and indirect impacts on public health and safety during decommissioning of solar arrays would be similar to those described for the construction of the solar arrays. A fire resulting from solar array decommissioning would be medium in severity but would be temporary, unlikely, and limited in spatial extent. Indirect impacts related to smoke and haze would be medium, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from solar arrays; inverter station transformers contained within solar arrays include small amounts of oil. Impacts associated with releases to the environment from solar array decommissioning that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts (few to no residents are located immediately adjacent to each proposed solar array location). Indirect impacts associated with releases to the environment are not expected.

Battery Energy Storage Systems

Direct and indirect impacts on public health and safety during decommissioning of the BESS would be similar to those described for BESS construction. A fire resulting from BESS decommissioning would be medium in severity but is considered temporary, unlikely, and limited in spatial extent. Indirect impacts from smoke and haze would be medium, temporary, unlikely, and regional in spatial extent.

Impacts associated with releases to the environment from BESS decommissioning that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts (few to no residents are located immediately adjacent to each BESS, depending on its specific location). Indirect impacts associated with releases to the environment are not expected.

Substations

Direct and indirect impacts on public health and safety during decommissioning of the substations would be similar to those described for the construction of the substations. A fire resulting from substation decommissioning would be medium in severity but would be temporary, unlikely, and limited in spatial extent. Indirect impacts related to smoke and haze would be medium in severity, temporary, unlikely, and regional in spatial extent.

There is little risk of hazardous material release to the environment from substations; transformers in each substation contain small amounts of oil. Impacts associated with releases to the environment from substation decommissioning that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13) but residents are not expected to experience direct impacts (few to none are immediately adjacent to each substation, depending on its specific location). Indirect impacts associated with releases to the environment are not expected.

Comprehensive Project

Decommissioning of the Project as a whole could result in both direct and indirect impacts on public health and safety. Direct impacts related to fire would be medium in severity, but temporary, feasible, and limited in spatial extent. Indirect impacts related to smoke and haze would also be medium in severity, temporary, and feasible, but regional in spatial extent.

Impacts associated with releases to the environment from Project decommissioning that may affect public health would be medium in severity but temporary, unlikely, and limited in spatial extent. Emergency responders would experience direct impacts (Section 3.13), but residents are not expected to experience direct impacts; few residents are located near the Micrositing Corridor, where the turbines would be located, or to the other Project components. Indirect impacts associated with releases to the environment are not expected.

4.13.2.4 Recommended Mitigation Measures

This section describes measures that would reduce or compensate for impacts related to public health and safety from construction, operation, and decommissioning of the Project. EFSEC has identified the following mitigation measures for the Project to avoid and/or minimize potential impacts on public health and safety. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

PHS-1[60]: Fire Suppression Aircraft Access: In the event of a major wildfire occurring in an area where fire suppression aircraft may need access near the Project, whether related to the Project or resulting from another cause, the Applicant would shut down turbines temporarily.

Rationale: This mitigation measure would allow access for fire suppression aircraft carrying water and fire suppression chemicals, as needed.

[60] PHS-: Identifier of numbered mitigation item for Public Health and Safety

4.13.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from the adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[61]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary

[61] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information[62]
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remains. The additional Applicant commitments identified above do not change the impact ratings previously provided for public health and safety in the Draft EIS, and the impact ratings remain the same.

4.13.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which in turn depend on the magnitude and duration of an impact. “Significant” in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This EIS weighs the potential impacts on public health and safety that may result from the Project with mitigation and makes a resulting determination of significance for each impact, shown in **Tables 4.13-3a, 4.13-3b, and 4.13-3c**. As shown in the impact summary tables below, EFSEC has determined that the Project would result in no significant unavoidable adverse impacts to public health and safety.

[62] The Applicant’s post adjudication commitments include updating the thermal runaway mitigation design of its BESS to align with the updated guidance from the NFPA 855 standard committee, members of the International Fire Code standard committee, and the Society of Fire Protection Engineers.

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Table 4.13-3a: Summary of Potential Impacts on Public Health and Safety during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Fire (Worker Health and Safety)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Fire resulting from Project construction is unlikely, but wildfire risk in the area is considered high. For instance, combustible materials and lubricants are contained in the nacelle of the turbines. Diesel-powered generators may be used during construction. Use of these materials could pose a fire risk.	Medium	Temporary	Feasible	Limited	No mitigation identified	None identified
Fire (Worker Health and Safety)	Solar Arrays BESS Substations	Fire resulting from solar array, substation, and BESS construction is unlikely, but wildfire risk in the area is considered high.	Medium	Temporary	Unlikely	Limited	No mitigation identified	None identified
Public Health (Smoke and Haze)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Fire resulting from Project construction is unlikely, but wildfire risk in the area is considered high. For instance, combustible materials and lubricants are contained in the nacelle of the turbines. Diesel-powered generators may be used during construction. Use of these materials could pose a fire risk.	Medium	Temporary	Feasible	Regional	No mitigation identified	None identified
Public Health (Smoke and Haze)	Solar Arrays BESS Substations	If a fire were to occur during construction of the solar arrays, substation, or BESS, indirect impacts could include smoke or haze, and a potential reduction in emergency response services.	Medium	Temporary	Unlikely	Regional	No mitigation identified	None identified
Public Health and Safety (Hazardous Materials Release)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Hazardous materials, including diesel fuel, lubricating oils, hydraulic fluid, paints, and solvents would be used and stored on site. Spill kits would be maintained, minimizing the risk of a release if a spill were to occur.	Medium	Temporary	Unlikely	Limited	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.13-3b: Summary of Potential Impacts on Public Health and Safety during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Fire (Worker Health and Safety)	Turbine Option 1 Turbine Option 2	Spontaneous fire or explosions from operating wind turbines are rare but could occur during Project operations.	Low	Temporary	Unlikely	Limited	**PHS-1:** Turbines will be shut down for the duration of any fire located within the region of the Project.	None identified
Fire (Worker Health and Safety)	Substations	Substation transformers have a minimal risk of fire or explosion during construction.	Medium	Temporary	Feasible	Limited	No mitigation identified	None identified
Fire (Worker Health and Safety)	BESS **Comprehensive Project**	Lithium-ion batteries used for the BESS may pose a risk of fire and explosion during operation because they may overheat, but the BESS would include a fire suppression system.	Medium	Temporary	Feasible	Limited	**PHS-1:** Turbines will be shut down for the duration of any fire located within the region of the Project.	None identified
Public Health (Smoke and Haze)	Turbine Option 1 Turbine Option 2 BESS Substations **Comprehensive Project**	Indirect impacts if a fire were to occur during operation of the turbines and substation could include smoke or haze, and a potential reduction in emergency response services.	Low	Temporary	Unlikely	Regional	**PHS-1:** Turbines will be shut down for the duration of any fire located within the region of the Project.	None identified
Release of Hazardous Materials	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Project elements include small amounts of oil and batteries, but a release is unlikely to occur during operations.	Negligible	Temporary	Unlikely	Limited	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.13-3c: Summary of Potential Impacts on Public Health and Safety during Decommissioning of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Fire (Worker Health and Safety)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Combustible materials and lubricants are contained in the nacelle of the turbines. Diesel-powered generators may be used during decommissioning. Use of these materials could pose a fire risk.	Medium	Temporary	Feasible	Limited	No mitigation identified	None identified
Fire (Worker Health and Safety)	Solar Arrays BESS Substations	Fire resulting from decommissioning BESS, solar array, and substations is unlikely, but wildfire risk in the area is considered high.	Medium	Temporary	Unlikely	Limited	No mitigation identified	None identified
Public Health (Smoke and Haze)	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	If a fire were to occur during turbine decommissioning, indirect impacts could include smoke or haze, and a potential reduction in emergency response services.	Medium	Temporary	Feasible	Regional	No mitigation identified	None identified
Public Health (Smoke and Haze)	Solar Arrays BESS Substations	If a fire were to occur during decommissioning of the solar arrays, substation, or BESS, indirect impacts could include smoke or haze, and a potential reduction in emergency response services.	Medium	Temporary	Unlikely	Regional	No mitigation identified	None identified
Release of Hazardous Materials	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Project elements include small amounts of oil, which could be released during decommissioning.	Medium	Temporary	Unlikely	Limited	No mitigation identified	None identified

Notes:
[(a)] The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[(b)] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[(c)] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[(d)] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

4.13.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to public health and safety from the construction, operation, and decommissioning of the Project would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.14 Transportation

This section describes the impacts on transportation that could result from Horse Heaven Wind Farm, LLC's (the Applicant) proposed Horse Heaven Wind Farm (Project, or Proposed Action) or under the No Action Alternative. Section 3.14 identifies transportation facilities within the study area for the Project. The study area for the transportation analysis includes roadway intersections, railroad mainlines, and waterway freight corridors in the vicinity of the Project, which is defined as approximately 4 miles south/southwest of the City of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River. Transportation systems beyond the Washington border, including analysis of Interstate 84 (I-84), are not included in this assessment.

Impacts are analyzed for construction, operation, and decommissioning of the Project. Laws and regulations that are now current may be different at decommissioning, and there is no way to anticipate how or if laws and regulations may change. The analysis of impacts from decommissioning is based on existing laws and regulations at the moment in time the Application for Site Certification (ASC) was submitted to the Washington Energy Facility Site Evaluation Council (EFSEC). EFSEC may request that additional studies be completed as a form of mitigation prior to the decommissioning of the Project.

4.14.1 Method of Analysis

In accordance with the Washington State Environmental Policy Act, this Environmental Impact Statement (EIS) weighs the likelihood of occurrence with the severity of an impact (Washington Administrative Code [WAC] 197-11-794) and considers several factors when determining the significance of identified potential impacts (WAC 197-11-330 and WAC 197-00-794). The impact rating is summarized in **Table 4.14-1**.

Table 4.14-1: Impact Rating Table for Transportation from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Table 4.14-2 defines the qualitative framework used herein to rank the magnitude impact for transportation.

Table 4.14-2: Criteria for Assessing Magnitude of Impacts on Transportation

Magnitude of Impacts	Description
Negligible	**Level of Service:** A decrease in LOS would not occur. **Access:** No impact expected to a public resource or private residence. **Roadway Safety:** There is no potential for roadway safety to decrease.
Low	**Level of Service:** Traffic volumes would increase, but a decrease in LOS is not expected. **Access:** Impacts could occur for access to public resources or private residences, but impacts would not be frequent during any stage of the Project. **Roadway Safety:** There is no potential for roadway safety to decrease.
Medium	**Level of Service:** Traffic volumes would increase measurably with the potential in LOS to decrease, but still be maintained at performance standards adopted in the transportation element of the Benton County Comprehensive Plan (Benton County 2022). **Access:** Impacts would be expected to occur for access to public resources or private residences. Impacts could occur frequently. **Roadway Safety:** Increased traffic on highways/freeways, at intersections or railroad crossing have the potential to decrease roadway safety.
High	**Level of Service:** Traffic volumes would increase measurably, and the LOS would decline below the performance standards adopted in the transportation element of the Benton County Comprehensive Plan (Benton County 2022). **Access:** Impacts would occur for access to public resources or private residences. Impacts would occur frequently and for measurable lengths of time. **Roadway Safety:** Increased traffic on highways/freeways, at intersections or railroad crossing are expected to decrease roadway safety.

LOS = level of service

Roadway-related impacts were evaluated based on standards, guidelines, and procedures published in the Highway Capacity Manual (TRB 2016). The transportation impact analysis included traffic count data assembled by the Applicant (Horse Heaven Wind Farm, LLC 2023).

This EIS considers the impact of the Project as a whole. To align the impact rating system described by the Applicant's transportation impact analysis in the ASC, this evaluation of transportation analyzes potential impacts from the Proposed Action in the context of the Applicant's example of a phased approach to construction:

- Phase 1 construction could generate power via wind and solar. Phase 1 could also include a battery energy storage system (BESS) capable of storing energy.
  - Phase 2 construction is divided into Phase 2a and Phase 2b, summarized as follows:
    - Phase 2a could consist of the construction of both wind and solar facilities. The Applicant's Phase 2a scenario also includes the construction of a BESS.
    - Phase 2b could increase power generation via the construction of additional wind turbines, but construction would not include a BESS.

Chapter 2 contains more information on the Applicant's example of a phased approach to construction. The construction schedule, including phasing of specific elements of the Project, could alter the details of the analysis. Additional analysis would be required in order to confirm what impact the combining of construction phases would have on traffic volume. The ASC suggests that any construction traffic volume increases from combining the two phases are expected to be minimal and unlikely to affect the analysis for the phased approach.

Applicant Commitments

The Applicant identified measures and/or best practices that are intended to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the Final ASC (Horse Heaven Wind Farm, LLC 2023) and taken into consideration in the characterization of potential impacts on recreation resources are discussed in Section 2.1.3 and summarized below.

- All road improvement and construction would be performed in conjunction with Benton County Public Works requirements following Benton County standards. The Applicant would maintain new access roads to access the turbine structures during operations.
- Prior to commencement of construction, the Applicant would consult with the Washington State Department of Transportation (WSDOT) and Benton County on the development of a Construction-Stage Traffic and Safety Management Plan.
- The Applicant would obtain all necessary WSDOT permits to access, modify ingress and egress for, or transport regulated loads on state-managed roadways.
- The Applicant would obtain WSDOT trip permits for oversized and overweight loads.
- When slow or oversized wide loads are being hauled, appropriate vehicle and roadside signing and warning devices would be deployed. Pilot cars would be used as WSDOT dictates, depending on load size and weight.
- A detailed haul plan would be developed once turbines have been selected and the construction schedule developed. This haul plan would confirm source locations and routes to be used during Project construction, as well as anticipated loads and haul schedule.
- The Transportation Study provided as Appendix V of the Final ASC would be verified and updated to include detailed condition assessments of roads to be used, structural assessments, and plans for improvement and maintenance.
- Ingress and egress points would be located and improved (if needed) to ensure adequate capacity for existing and projected traffic volumes and to provide efficient movement of traffic, including existing and anticipated agricultural traffic.
- The Applicant would coordinate with EFSEC and Benton County to identify a qualified third-party engineer who would document road conditions prior to construction and again within 30 days after construction is complete or as weather permits.
- A service agreement between the Applicant and Benton County would ensure post-construction road restoration to conditions as good or better than preconstruction.
- The Applicant or its contractor and EFSEC staff would meet prior to final site plan approval to outline steps for minimizing construction traffic impacts, including conflicts if state-imposed roadway restrictions could affect transporter routes.

- The Applicant or its contractor would provide advance notification to adjacent landowners and farmers through mailing, informal meeting, open house, or other similar methods when construction would take place in the vicinity of their homes and farms to help minimize access disruptions.
- All construction vehicles would yield to school-related vehicles (e.g., school buses) and would lower their speed when approaching a school bus or bus stop along the transporter route.
- Advanced warning and proper roadway signage would be placed on major state and Benton County roads to warn motorists of potential Project-related vehicles entering and exiting the roadway.
- Carpooling among the construction workers would be encouraged to reduce traffic volume to and from the Project site.
- Detour plans and warning signage would be provided in advance of any planned traffic disturbances.
- The Project will utilize appropriate signage where needed to direct the public from entering restricted areas. During construction, temporary barriers and traffic control measures will be utilized where applicable.
- Flaggers would be employed as necessary to direct traffic when large equipment is exiting or entering public roads to minimize the risk of accidents. Should the Applicant or its construction contractor receive notice during Project construction of transportation events (e.g., WSDOT or Benton County transportation projects, roadway incidents, other traffic events) that give rise to a safety concern, the Project construction manager would review the Traffic and Safety Management Plan in coordination with the applicable agency and address additional safety measures, including flagging, as may be appropriate for the situation.
- If lane closure must occur, adequate signage for potential detours or possible delays would be posted.
- Advance notification would be provided to emergency providers and hospitals when public roads may be partially or completely closed.
- Emergency vehicles would be given the right-of-way as required by local, state, and federal requirements.
- Site access roads and an entrance driveway to the operation and maintenance (O&M) facilities on site would be constructed to service truck movements of legal weight and provide adequate sight distance.
- Traffic control requests would be coordinated through the WSDOT traffic engineer and the Benton County Public Works Department, abiding by seasonal County road restrictions.
- A haul and approach route would be developed in coordination with the appropriate jurisdictional authorities.
- Permanent private Project access roads would be maintained by the Applicant for the life of the Project.
- Tracked vehicles and heavy trucks would be restricted to approved transporter roads to prevent damage to the surface and base of Benton County roads.
- Turbines and permanent meteorological towers would be lit according to Federal Aviation Administration (FAA) regulations.
- The Applicant would obtain Determinations of No Hazard to Air Navigation from the FAA prior to the construction of each turbine.

- Advance warning and proper roadway signage would be placed on highways and Benton County roads to warn motorists of potential vehicles entering and exiting the roadway.
- After construction, all-weather access roads (including graveled roads), suitable to handle emergency equipment, would be provided within 150 feet of any built structure or surface activity area.
- If the final Project construction schedule coincides with the County's planned paving operation on County Well Road, the Applicant will coordinate its construction and transportation activities with Benton County Public Works for reasonable accommodation to avoid conflicts between the two actions. A Traffic Management Plan will also be developed for each phase of construction, to alert drivers of increased construction traffic entering and exiting the public roadways.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.14.2.5, Post-Adjudication Applicant Commitments.

4.14.2 Impacts of Proposed Action

Impacts on vehicular traffic from the Project are expected and are described for the construction, operation, and decommissioning of the Project in Sections 4.14.2.1, 4.14.2.2, and 4.14.2.3, respectively.

Transportation Systems

A source haul route has not been finalized. The designated haul routes and methods of transport would be a commercial decision and an element of the negotiated purchase agreement. Development of some of the required information, such as source location for products, detailed schedule, and structural assessment of existing transportation systems, would be provided following turbine selection. EFSEC will review final commercial decisions to determine if additional environmental analysis is needed.

Wind energy components for similar projects, including tower sections, nacelle and turbines, and blades, have been shipped to either a western U.S. port or overland on the interstate highway system. The U.S. ports near the Project site are the Port of Longview and the Port of Vancouver, from which components would be transported by specialized trucks along interstate, state, county, and private roadways.

New access roads, constructed within the Lease Boundary, would be owned and maintained by the Applicant; the general public would not have access to these roads during construction, operation, or decommissioning of the Project, although participating landowners would maintain access during the Project. All work done on existing Benton County roads would be performed in accordance with Benton County standard plans and with review and approval by the County Engineer (Benton County n.d.).

Vehicular Traffic

Approximately 29 intersections, not including new Project access roads, are present in the Project vicinity that would be utilized for the Project. A subset of seven intersections was chosen to provide an estimate of the largest potential site-wide level of service (LOS) impacts. Benton County's designated LOS is "C." A roadway meets an LOS C standard when traffic flow remains uninterrupted, even at peak hours, by congestion or delays related to traffic volume and configuration (Benton County 2022). When new demands on the service system exhaust the available capacity and decrease the LOS below the designated LOS of C, new capacity must be created. Typically, new capacity is created by modifying the geometrics of the roadway (e.g., adding a new traffic lane, turning lane, widening shoulders, etc.).

Impacts of the construction, operation, and decommissioning of the Project on vehicular traffic are assessed in this analysis.

Air Traffic

An FAA Determination of No Hazard to Air Navigation would have to be obtained for the Project. Minimal glare is anticipated from the Project's solar arrays (see Section 4.10). The Project would adhere to all FAA and Benton County development regulations as they pertain to turbine siting and safety. In accordance with Washington State requirements under House Bill (HB) 1173, passed in 2023, an application would be submitted to the FAA to allow installation of a light mitigating technology system known as Aircraft Detection Lighting Systems (ADLS). If authorized by FAA, the ADLS would be installed to reduce the need for nighttime flashing red warning lights on Turbines.

The FAA developed Federal Aviation Regulation (FAR) Part 103 to regulate certain piloted "vehicles" flown for recreation and sport purposes. Such ultralight vehicles are described in FAR 103.1 and include what are commonly known as paragliders, hang gliders, ultralights, powered paragliders, and powered parachutes. FAR Part 103 states that an ultralight vehicle cannot be used in commercial operations or operated in any manner that creates a hazard to persons or property. It cannot be operated over any congested area, over an open-area assembly of persons, or any airport traffic area, any air traffic control zone, or any area covered by airport radar service. The paragliding and hang gliding recreational activities are analyzed in Section 4.12.

Impacts on commercial air traffic are not expected and are not discussed further in this analysis.

Waterborne and Rail Traffic

Some Project components may be delivered to ports, such as the Port of Vancouver or Port of Longview, for Project construction. Detailed transportation plans, including port delivery locations and long-range transport routes, would be developed following turbine selection. No Project construction activities would interfere with existing waterborne or rail transportation in Benton or Franklin County, and if components are delivered to a port, it would be a facility accustomed to handling large deliveries and capable of managing components such as those required for a wind farm.

Impacts on waterborne traffic are not analyzed in further detail herein.

Rail transportation could be utilized as there are Burlington Northern Santa Fe Railway facilities near the Lease Boundary. As rail transportation was not considered in the ASC, this EIS does not include a determination of impact on railroad operations.

Rail transportation is not analyzed in further detail herein.

Parking

Parking during construction and decommissioning (e.g., of construction vehicles) would occur at construction laydown yards and within the Wind Energy Micrositing Corridor. These parking locations would not impede or displace any existing parking areas in the study area.

Once constructed, the O&M facilities would have parking areas for operations vehicles. Plans for maintenance and runoff control from the parking areas at the O&M facilities would be dictated by the Erosion and Sediment Control Plan, including the best management practices, and a Stormwater Pollution Prevention Plan. The Project would not displace any existing private parking within the area, and no impacts related to existing parking would occur.

Parking is not analyzed in further detail herein.

Movement/Circulation of People or Goods

Interstate 82 (I-82) is a four-lane divided highway, allowing for movement or circulation of people around larger loads exiting the interstate. Multipurpose use (e.g., vehicular, bicycle, pedestrian) of existing rights-of-way on existing roads would be maintained during construction, operation, and decommissioning of the Project. No multipurpose use of new Project access roads would occur during construction, as the new Project roads would not be open to the public. Potential impacts on the movement/circulation of people or goods, in relation to the broader element of transportation, are assessed in this analysis.

Traffic Hazards

Traffic hazards associated with construction projects are generally related to accident occurrence. There are no railroad crossings, school zones, or dedicated pedestrian crossings within the Lease Boundary. School zones that exist within the study area for the Project are described in Section 3.14.

Railroad crossings and other grade fluctuations pose high levels of risk for oversized loads with low ground clearance. The hazards include the fact that trains cannot stop quickly. Railroad crossings that are in the vicinity of the Project (USDOT n.d.) and that could intersect the assumed transport routes of materials for the Project are discussed in Section 3.14.

Traffic counts for rail crossings were not provided in the ASC but would be included in the required traffic analysis, as discussed in Section 4.14.2.4. All crossings except Crossing 928192L are located above (via an overpass) or under (via an underpass) the transport route. Crossing 928192L along Dallas Road is a grade crossing, meaning that the crossing occurs at the same grade as other traffic. Stopping distances for passenger trains are comparable to those for freight trains. A 150-car freight train at 50 miles per hour (mph) needs 8,000 feet to stop, and an eight-car passenger train at 79 mph needs about 6,000 feet to stop (USDOT 2020).

The Highway Safety Manual (HSM) analysis indicates that four of the study area intersections, listed below, could potentially be improved with safety measures (Horse Heaven Wind Farm, LLC 2023):

- Route 221 at Sellards Road
- Route 221 at Route 14
- Route 14 at S. Plymouth Road
- Webber Canyon Road and Badger Road

Traffic hazards occur with all projects, especially projects that require work zones for maintaining and upgrading roadways. Daily changes in traffic patterns, narrowed rights-of-way, and other construction activities often create a combination of factors resulting in crashes, injuries, and fatalities (USDOT FHWA 2021). Potential traffic intersection improvements, as indicated by the Applicant, are shown in **Figure 4.14-1**.

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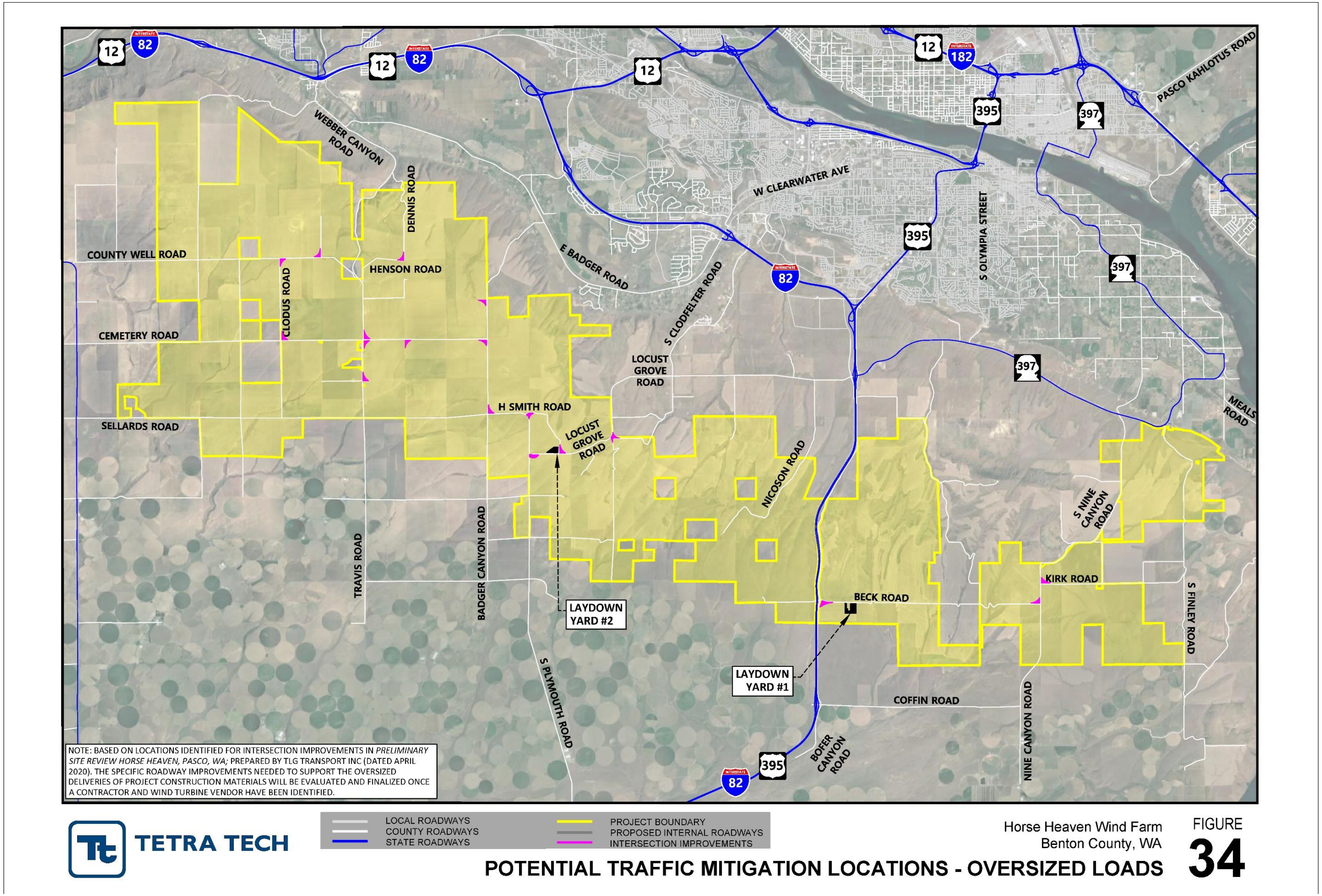

Source: Horse Heaven Wind Farm, LLC 2023

Figure 4.14-1: Potential Traffic Mitigation Locations - Oversized Loads

4.14.2.1 Impacts during Construction

During peak construction, a typical day would include the transportation of workers, transportation of materials, and movement of heavy equipment.

On-site workers would include technicians, laborers, foremen, equipment operators, and construction managers, with approximately 62 percent of these positions expected to be filled by workers normally residing in Benton and Franklin Counties (Horse Heaven Wind Farm, LLC 2023). Most of the construction worker traffic would originate from the Tri-Cities of Kennewick, Pasco, and Richland, as well as nearby communities. The workforce would use the same roads to access the Project as the equipment transporters. To be conservative with analysis, it is assumed that workers would drive alone and that the average vehicle would only have 1.25 occupants (Horse Heaven Wind Farm, LLC 2023). Private vehicles would primarily travel mornings and evenings, corresponding to the workday, and the construction truck traffic would be more uniformly distributed throughout the workday. For the LOS analysis, the more conservative 374 worker trips for the construction of the first half of the Project and 344 worker trips for the construction of the second half of the Project were used. Two Project laydown yard locations have been preliminarily identified, one adjacent to the eastern substation location on Beck Road and one along Locust Grove Road near the intersection with H Smith Road.

During construction, trucks would use I-82, State Route 397, and local Benton County roads to bring construction equipment, turbine components, solar components, substation equipment, and transmission line equipment to the various Project construction sites. One of the identified improvement projects identified in the Benton County 2022-2027 Six-Year Transportation Improvement Plan includes a segment of County Well Road. The segment is on the west side of the Project and is scheduled to be reconstructed to an all-weather standard by Benton County during the same time as Project construction and operation (Benton County 2021; Horse Heaven Wind Farm, LLC 2023).

Trucks would also be used to bring road base aggregate to improve existing roads and construct new access roads; concrete for the turbine, substation, BESS, and O&M facility foundations; and water for dust control. Some large Project components such as turbine blades, tower components, and nacelles may be delivered to remote ports, such as the Port of Vancouver or Port of Longview, and transported overland via I-84 to I-82. Other components may originate within the continental United States and be transported overland from other locations to I-84 and on to I-82 (Horse Heaven Wind Farm, LLC 2023).

Typical construction equipment used in the construction of wind and solar facilities is listed in **Table 4.14-3**. Two laydown yards would be established within the Lease Boundary to facilitate the delivery and assembly of materials and equipment. Equipment such as excavators, trenching equipment, backhoe loaders, cranes, forklifts, and other material handling equipment would be brought on site by a flatbed semi-tractor trailer and would remain on site throughout construction. Equipment such as water trucks, fuel trucks, service trucks, and trucks delivering components would make frequent trips to deliver supplies. Some trucks would be required to obtain oversize/overweight permits, which allow travel on all unrestricted roads.

Table 4.14-3: Construction Equipment

Type of Equipment	Construction Use
Heavy Vehicles	
Bulldozer (medium)	Access road and driveway leveling
Scraper	Access road and driveway leveling
Drum Compactor	Compacting
Skid Steer Loader	Light soils work for slabs and foundations
Road Grader	Access road and driveway leveling
Excavator	Trenching and foundations
Trenching Equipment/Cable Plows	Trenching
Backhoe Loader	Moving materials
Tracked Pile Driver	Driving piles into ground
Cable Reel Truck	Dispensing cable
Concrete Pump Truck	Delivering concrete
Mobile Hydraulic Crane/Truck Mounted Crane	Moving materials
2,000 kW Generators	Turbine Commissioning
Load Banks	Turbine Commissioning
Large Crawler Crane	Moving materials
Water Trucks	Dust control
Fuel Trucks	Refueling equipment
Non-heavy Vehicles	
Forklifts/Telehandler	Moving materials, loading and unloading of trucks
Personnel Transport Vehicles	Transporting workers
Other Material Handling Equipment	Moving materials
Service Trucks	Maintaining heavy equipment
Other Equipment	
Disposal Containers	Disposing of and removing construction debris
Other General Industrial Equipment	Assembling structures
Plate Compactors/Jumping Jacks	Compacting soil for concrete slabs and foundations
Pressure Washers	Cleaning
Storage Containers	Storing on-site materials
Welders	Assembling structures

Source: Horse Heaven Wind Farm, LLC 2023
kW = kilowatt

During construction, portions of existing roads may need to be improved, resulting in the temporary widening and increased turning radii of some public and private roads. Following the completion of construction, these improvements would be removed and the area restored to preconstruction conditions to the extent practical unless otherwise requested by the landowner. TLG Transport (TLG) reviewed whether trucking configurations for towers and blades could reach previously proposed pad sites along proposed access routes within the Lease

Boundary (Horse Heaven Wind Farm, LLC 2022, Appendix V). TLG's assessment was conducted using preliminary information provided by the Applicant. The report may not represent a complete list of all necessary improvements, as changes to the site design may require additional improvements as the Project evolves. The road improvement information provided would be updated when turbine selection and layout have been finalized. Preliminary road intersection improvements are identified in Figure 3.14-2 and Figure 3.14-3.

In consultation with WSDOT, the Applicant chose 10 roadway segments and 29 study area intersections that could potentially be impacted during Project construction for analysis in the Final ASC. Two additional intersections, located at the proposed future site driveways to laydown areas, were also included in the Applicant's analysis. The Project would result in short-term increases in traffic levels due to the daily movement of construction workers to and from the Project site, as well as daily material and equipment deliveries. Based on the Final ASC, the proposed Project would not result in any capacity constraints at the study area roadways or intersections (Horse Heaven Wind Farm, LLC 2023).

The proposed Project would result in a maximum increase in delay of approximately 2 seconds per vehicle except at the intersection of Bofer Canyon Road and Locust Grove Road/Route 397. This intersection is expected to have an increase in delay of approximately 8.1 seconds during the weekday PM peak hour for Phase 1 to Laydown Yard 1. The proposed site driveways serving Laydown Yard 1 and Laydown Yard 2 are expected to operate at LOS B or better for all construction scenarios. All roadway segments analyzed are expected to operate at LOS A during all analysis scenarios, except for I-82 (north of Coffin Road) which will operate at LOS B or better. This roadway segment will operate at LOS A in the northbound direction and LOS B in the southbound direction during all analysis scenarios. The proposed Project would have no measurable impact to roadway operations (with no change in the LOS due to Project-related traffic increases). The unsignalized intersection capacity analysis completed by the Applicant indicates that the intersections would be maintained at an LOS of D or better.

Local Gravel Roads

It is likely that all local gravel roads would be improved to accommodate the heavy vehicle traffic associated with the Project, and the improved condition would remain even after construction, resulting in high probability of improved ride quality and road surface condition (Horse Heaven Wind Farm, LLC 2023). A maintenance agreement with Benton County would be developed for the paved roads to repair any damaged caused by construction. At most locations this is not a concern; however, some of the paved roads that usually have very little if any truck traffic may not be designed for the size and frequency of loads that would occur for the Project. Preconstruction improvements for reasonable and necessary actions and condition assessment for all roads would be addressed through a maintenance agreement. Thus, only occasional short delays would be experienced during the improvement of roads for construction.

Turbine Option 1

Additional impacts are likely due to the delivery of large components. The delays caused by slow-moving large components are not quantifiable; however, navigation throughout the area, particularly of turbine blades, is expected to cause occasional delays and obstructions while turning. Temporary road modifications would be required in order to accommodate the necessary large-component turning radii at designated locations. Up to 275 truck trips per day would be generated by activities related to public road intersection improvements, access roads, substations, O&M facilities, transmission lines, and turbine construction during the 22-month construction timeframe for the combination of Phase 1 and Phase 2b, resulting in an estimated total of 68,621 truck trips. Construction equipment that moves on a day-by-day basis, such as cranes and derricks that would be used for the construction of the proposed towers, could pose a hazard to aviation safety for non-commercial aircraft during the construction period.

Impacts from turbine construction under Turbine Option 1 that may affect transportation would be medium in magnitude due to the increased possibility of incidents during the improvements to roadways that could be required for the transportation of turbines and potential impacts on access to public facilities such as recreation resources. Impacts would be short term in duration due to the impacts occurring during the Construction Stage. Impacts would be unavoidable due to the size of the turbines, required road improvements, and the amount of truck trips required for transport. Impacts from the transportation of the heavy and wide loads could occur outside of the Lease Boundary past neighboring receptors, indicating a regional spatial extent.

Turbine Option 2

Impacts on transportation during construction of turbines under Turbine Option 2 would be similar to those described for construction under Turbine Option 1. Impacts from turbine construction under Turbine Option 2 that may affect transportation would be medium in magnitude due to the increased potential for incidents during the potential improvements to roadways required for the transportation of turbines and short term in duration due to the impacts occurring during the entire Construction Stage. Impacts would be unavoidable due to the size of the turbines, required road improvements, and the amount of truck trips required for transport. Impacts from the transportation of the heavy and wide loads could occur outside of the Lease Boundary past neighboring receptors, indicating a regional spatial extent.

Solar Arrays

The transportation of solar arrays throughout the area is expected to cause occasional delays and obstructions while the trucks are turning. Approximately 152 truck trips per day would be generated by solar array construction, resulting in an estimated 40,023 truck trips.

Impacts would be medium in magnitude due to the increase in traffic, short term in duration, unavoidable, and local in spatial extent due to neighboring receptors seeing a decrease in LOS, but interstates are believed to be able to handle the increase in traffic.

Battery Energy Storage Systems

The transportation of BESS components throughout the area is expected to cause occasional delays and obstructions while trucks are turning. Approximately 14 truck trips per day would occur for the construction of the two BESS, resulting in a total of 3,548 truck trips.

Impacts would be low in magnitude, temporary in duration, probable during the transportation of BESS-related components, and local in spatial extent.

Substations

Impacts during the construction of the substations could occur due to the delivery of large components. The transportation of substations throughout the area could cause occasional delays and obstructions while trucks are turning.

Impacts would be low in magnitude due to the minor increase in traffic, temporary in duration due to the short time expected to transport the materials required to construct the substations, probable during the transport of substation-related components, and local in spatial extent.

Comprehensive Project

It is assumed that construction of the transmission lines would occur concurrently with the wind farm, solar, and BESS construction so that the combined average daily trips during the 21 to 22 months when all activities are underway would be approximately 365 truck trips per day. Because construction material and equipment traffic is not uniform, this number is increased by 25 percent to estimate peak periods, yielding an estimated maximum of 457 truck trips per day during peak construction.. Applicant-committed measures would be implemented to reduce the level of impact. For these reasons, the Project would be consistent with the transportation element of the Benton County Comprehensive Plan.

During Project construction, many construction vehicles, including trucks with oversized and overweight loads, would need to share the existing roadway network with the general public. As a result, some accidents could occur that would be directly attributable to construction traffic. Emergency vehicles may experience delays responding to emergencies if public roads are partially or completely closed. During construction, fuels and waste products would be transported to and from the Project by a licensed specialized tanker vehicle on an as-needed basis. Spill prevention during construction would include preventive procedures to avoid spills during transportation and the requirement of a Spill Prevention Control and Countermeasures Plan, to be developed by the construction contractor.

The ASC analyzed impacts closest to the Lease Boundary and did not address areas at further distances. Considering the amount of Project-related truck and worker commute traffic, there could be a medium-magnitude impact on the public’s access to recreational facilities and private residences within 3 miles of the Lease Boundary, a low-magnitude impact on areas within 3 to 6.5 miles of the Lease Boundary, and a negligible magnitude impact on the public’s access to facilities past 6.5 miles. A high-magnitude impact on access is not expected. Farming equipment may experience traffic delays along roadways due to the construction required for road modifications, transportation of oversized loads, and the increase in commuter traffic. Recreationists using facilities that utilize the same access roads as the Project may experience delays during the Construction Stage, and impacts are further analyzed in Section 4.12.

Impacts from the combined construction of the Project would be medium in magnitude, short term due to the potential for impacts to occur during the entire Construction Stage, unavoidable, and regional in spatial extent.

4.14.2.2 Impacts during Operation

The ASC did not provide information that would allow separate analysis of the operation of Turbine Option 1, Turbine Option 2, substations, and BESS. Once operational, expected traffic volumes during normal operation of the Project would be up to 16 to 20 vehicle trips per day to and from the O&M facilities by O&M staff. O&M staff would commute to the Project during normal peak commuting hours. It is assumed that O&M staff would reside in the Tri-Cities or nearby communities and use the same roads that would be used by the workforce during construction of the Project; operational traffic generation would be minimal. O&M staff would perform scheduled preventive maintenance on the turbines, solar module, and battery storage facilities. O&M staff would drive throughout the Project on a regular basis conducting unrecorded visual inspections of the Project. Truck traffic would be minimal; heavy equipment may be brought in occasionally for major repairs or turbine replacement, but these occasions are expected to be infrequent.

Additional trips may occur in the form of delivery vehicles (e.g., FedEx/UPS) used to deliver small packages to the site; however, these deliveries would be infrequent. It is anticipated that O&M staff would drive light-duty trucks, water trucks, and utility vehicles kept at the O&M facilities (not driven off site) to conduct maintenance.

Routine maintenance, and repair or replacement, of Project components are expected to occur. Although routine maintenance could be expected every six months, replacement of larger parts would occur infrequently (EPA 2013). Impacts on traffic during maintenance activities for larger parts would be low due to the few events expected to occur, temporary and only occurring during events, unavoidable due to required maintenance, and local.

Solar Arrays

The solar panels may be cleaned during operations. Water would be carried via 4,000-gallon trucks for about 168 trucks per cleaning event. Each cleaning event would consist of about one week, three times per year. The anticipated number of 35 trucks per day over one week, three times per year, that would be used for the cleaning is substantially less than those used during peak construction and would not result in a significant impact on local roads or traffic conditions.

Impacts from the operation of solar arrays would be low in magnitude, temporary during the cleaning of the solar arrays, probable due to the minor increase of traffic, and local in extent.

Comprehensive Project

During operation, it is expected that traffic conditions similar to those listed under existing conditions would continue to exist. The Project would add 16 to 20 vehicle trips per day to the O&M facilities by O&M staff, with an additional 35 trips per day during periods of panel washing.

Traffic hazards would be minimized by following the U.S. Department of Transportation Pipeline and Hazardous Material Administration regulations related to the shipment of lithium-ion batteries, and following the commitments outlined in Section 4.3.3 of the ASC.

Because there would be minimal O&M staff activity, minimal impacts on traffic and on transportation infrastructure are expected. The Applicant would maintain new access roads during operations. Given the minimal vehicular traffic during Project operations, and as Project facilities would not displace or impede transportation networks, no change is expected to the current movement or circulation of people or goods during operation of the Project. Multipurpose use of existing rights-of-way on existing roads would be maintained during operation of the Project. No multipurpose use of new permanent Project access roads would occur, as private Project access roads would not be open to the public.

Impacts on transportation from the Project operations would be low in magnitude; long term during the life of the Project; probable, due to solar panel washing; and local in spatial extent.

4.14.2.3 Impacts during Decommissioning

After dismantling the facility, high-value components would be removed for recycling or scrap. The remaining materials would be reduced to transportable size and removed from the site for disposal. Unsalvageable materials would be disposed of at authorized sites in accordance with applicable regulations. Prior to decommissioning, the Applicant would consult with WSDOT and Benton County on the development of a Decommissioning-Stage Traffic and Safety Management Plan that may include an updated traffic analysis.

Turbine Option 1

The disassembly and removal of turbines would essentially be the same as their installation, but in reverse order. Turbine tower portions and blades would be sized on site for transport by regular-sized haul trucks (no oversize permits or specialized equipment needed).

Impacts on transportation during decommissioning of turbines under Turbine Option 1 would be low in magnitude due to components being sized appropriately for transport and not requiring oversize permits, short term in duration, unavoidable, and regional in spatial extent due to the dismantled material having to be transported outside of the Lease Boundary and past neighboring receptors, potentially on other rural roads not near the Lease Boundary.

Turbine Option 2

Impacts on transportation during decommissioning of turbines under Turbine Option 2 would be similar to those described for construction under Turbine Option 2. Impacts would be low in magnitude due to components being sized appropriately for transport and not requiring oversize permits, short term in duration, unavoidable, and regional in spatial extent due to the dismantled material having to be transported outside of the Lease Boundary and past neighboring receptors, potentially on other rural roads not near the Lease Boundary.

Solar Arrays

Solar photovoltaic modules used for the Project would be dismantled and packaged per manufacturer or approved recycler specifications and shipped to an approved off-site recycler. Impacts on transportation during decommissioning of solar arrays would be similar to those described for the construction of solar arrays. Impacts would be low in magnitude, short term in duration, unavoidable, and regional in spatial extent due to the increase in traffic having an impact on rural roads near the Lease Boundary.

Battery Energy Storage Systems

Batteries would be recycled if feasible and otherwise transported to an approved disposal facility. Impacts on transportation during decommissioning of BESS would be similar to those described for the construction of BESS. Impacts would be low in magnitude, temporary in duration, probable, and local in spatial extent.

Substations

All aboveground structures associated with the substations, including the conductors, switches, transformers, fencing, and other components, would be dismantled and removed from the site. Impacts on transportation during decommissioning of substations would be similar to those described for the construction of substations. Impacts would be low in magnitude, temporary in duration, probable, and local in spatial extent.

Comprehensive Project

Impacts on transportation during decommissioning of the Project would be similar to those described for the construction of the Project. Impacts would be low in magnitude, short term in duration, unavoidable, and regional in spatial extent.

4.14.2.4 Recommended Mitigation Measures

This section describes the measures that would reduce or compensate for impacts related to traffic from construction, operation, and decommissioning of the Project. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

EFSEC has identified the following additional and modified mitigation measures that could be required by EFSEC, but may also involve the participation of other parties, for the Project to avoid and/or minimize potential impacts on transportation. EFSEC would work with the identified parties to facilitate cooperation in implementing this mitigation measure:

TR-1:[63] The load movement team would review the procedures to be followed if the load should become lodged at a crossing and would review the emergency contact numbers for each crossing daily—that is, before starting travel for the day.

Rationale: Ensures safe practices during the transportation of materials for construction and decommissioning.

TR-2: The Applicant would work with WSDOT and Operation Lifesaver to provide train safety presentations to employees and contractors to increase knowledge regarding train safety, including train track crossings. Since this measure involves action by another agency, it cannot be required by EFSEC and cannot be considered fully effective mitigation for the purpose of this analysis.

Rationale: Lessens potential collisions at train crossings.

TR-3: A third-party engineer would provide a traffic analysis prior to decommissioning. The traffic analysis would evaluate all modes of transportation (e.g., waterways, rail, roads, etc.) used for the movement of people and materials during decommissioning via the haul route(s) in Washington State.

Rationale: Ensures that no changes have occurred since the traffic analysis was originally provided prior to construction.

TR-4: All railroad crossing and grade changes would be included in a route survey performed by a third-party engineer, with the Washington Utilities and Transportation Commission participating, to determine if current traffic control systems at crossings are appropriate or if additional mitigation is needed prior to decommissioning. The route survey would include anticipated traffic counts. Since this measure would require the participation of other agencies before it could be implemented, it cannot be considered fully effective mitigation for the purpose of this analysis.

Rationale: Ensures that no changes have occurred since the route survey was originally provided prior to construction.

TR-5: The analysis of impacts from decommissioning is based on existing laws and regulations at the time when the ASC was submitted to EFSEC. The Applicant would consult with WSDOT and Benton County on the development of a Decommissioning-Stage Traffic and Safety Management Plan, prior to decommissioning. The Traffic and Safety Management Plan must include a safety analysis of the WSDOT-controlled intersections (in conformance with the WSDOT Safety Analysis Guide) and recommend mitigation or countermeasures where appropriate. The analysis would review impacts from decommissioning traffic and be submitted to WSDOT for review and comment prior to decommissioning. Since this measure would require the participation of other agencies before it could be implemented, it cannot be considered fully effective mitigation for the purpose of this analysis. EFSEC would work with the identified agencies to facilitate cooperation in implementing this mitigation measure.

Rationale: Ensures that no changes have occurred to the laws and regulations used in this analysis.

[63] TR-: Identifier of numbered mitigation item for Transportation

TR-6: The Applicant provided a Traffic Impact Analysis (TIA) with the Final ASC (Horse Heaven Wind Farm, LLC 2023). Oversize truck routes to the Project Area were analyzed using I-82, north through State Route 397, Locust Grove Road, and Plymouth Road. Additionally, the delivery of turbine towers was only analyzed from I-82 to the Locust Grove/State Route 397 exit. The use of additional routes for oversize or overweight deliveries would require supplemental analysis and approval by EFSEC.

Rationale: Ensures consistency with state and county transportation plans and codes.

TR-7: Coordinate with WSDOT, Benton County, and EFSEC prior to construction and prior to decommissioning on potential mitigation for intersections with safety concerns. Mitigation may include the installation of warning signs, rumble strips, or other measures to alert motorists of intersections.

Rationale: Ensures safe practices during the transportation of materials for construction and decommissioning.

4.14.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the expected changes that the Applicant was making to the Project made in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)

- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and include the undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[64]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of the Washington State Department of Natural Resources (DNR) Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains similar due to the turbines and other Project infrastructure that remain unchanged. The additional Applicant commitments identified above do not change the impact ratings previously provided for transportation in the Draft EIS, and the impact ratings remain the same.

4.14.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This EIS weighs the potential impacts on transportation that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.14-4a, 4.14-4b,** and **4.14-4c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur in relation to transportation.

[64] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

Table 4.14-4a: Summary of Potential Impacts on Transportation during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation©	Significant Unavoidable Adverse Impacts[d]
Vehicular Traffic	Turbine Option 1 Turbine Option 2 **Comprehensive Project**	Traffic volumes would increase measurably during transportation of material and equipment for the construction of the turbines. The potential for traffic volumes and slower, oversized roads would likely decrease level of service for intersections near the Lease Boundary and highways/ freeways. The increase in traffic volumes and the size of construction material may decrease roadway safety at intersections near the Project or on railroad crossings.	Medium	Short Term	Unavoidable	Regional	**TR-1:** Daily transport communication, including emergency numbers **TR-2:** Operation Lifesaver safety presentation and training **TR-6:** Supplemental analysis of additional routes, if proposed **TR-7:** Mitigation for intersections with safety concerns	None identified
Vehicular Traffic	Solar Arrays	Traffic volumes would increase measurably during transportation of material and equipment during the construction of the solar arrays and would likely decrease level of service for intersections near the Lease Boundary. The increase in traffic volumes may decrease roadway safety at intersections near the Project or on railroad crossings.	Medium	Short Term	Unavoidable	Local	**TR-1:** Daily transport communication, including emergency numbers **TR-2:** Operation Lifesaver safety presentation and training **TR-6:** Supplemental analysis of additional routes, if proposed **TR-7:** Mitigation for intersections with safety concerns	None identified
Vehicular Traffic	BESS Substations	Traffic volumes may increase, but a decrease in level of service is not expected, nor is there the potential for roadway safety to decrease.	Low	Temporary	Probable	Local	**TR-1:** Daily transport communication, including emergency numbers **TR-2:** Operation Lifesaver safety presentation and training	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system(s); EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.14-4b: Summary of Potential Impacts on Transportation during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Vehicular Traffic	Turbine Option 1 Turbine Option 2 BESS Substations	Maintenance of facilities would include preventive and expected maintenance throughout the operation of the Project.	Low	Temporary	Unavoidable	Local	No mitigation identified	None identified
Vehicular Traffic	Solar Arrays	Operation of the solar arrays may require water trucks to deliver wash water to clean the panels.	Low	Temporary	Probable	Local	No mitigation identified	None identified
Vehicular Traffic	**Comprehensive Project**	A decrease in level of service is not expected, nor is roadway safety expected to decrease.	Low	Long Term	Probable	Local	**TR-2:** Operation Lifesaver safety presentation and training	None identified

Notes:
[a] The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[d] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system(s); EFSEC = Washington Energy Facility Site Evaluation Council; N/A = Not enough information to provide a separate analysis.

Table 4.14-4c: Summary of Potential Impacts on Transportation during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Vehicular Traffic	Turbine Option 1 Turbine Option 2 Solar Arrays **Comprehensive Project**	Decommissioning would require the removal and transportation of the dismantled pieces of the turbines, expected to be smaller than the pieces that arrived during the Construction Stage. The increase in traffic volumes is not expected to decrease level of service or cause a decline in roadway safety.	Low	Short Term	Unavoidable	Regional	**TR-1:** Daily transport communication, including emergency numbers **TR-2:** Operation Lifesaver safety presentation and training **TR-3:** Traffic Analysis **TR-4:** Railroad crossing and grade change survey **TR-5:** Traffic and Safety Management Plan **TR-6:** Supplemental analysis of additional routes, if proposed **TR-7:** Mitigation for intersections with safety concerns	None identified
Vehicular Traffic	BESS Substations	Decommissioning would require the removal and transportation of the BESS and substations. The increase in traffic volumes is not expected to decrease level of service or cause a decline in roadway safety.	Low	Temporary	Probable	Local	**TR-1:** Daily transport communication, including emergency numbers **TR-2:** Operation Lifesaver safety presentation and training **TR-3:** Traffic Analysis **TR-4:** Railroad crossing and grade change survey **TR-5:** Traffic and Safety Management Plan	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system(s); EFSEC = Washington Energy Facility Site Evaluation Council

4.14.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to transportation from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.15 Public Services and Utilities

This section describes potential impacts on public services and utilities from the proposed Horse Heaven Wind Farm (Project, or Proposed Action) or under the No Action Alternative. Public services such as law enforcement, fire protection, emergency management services, and hospitals are evaluated in Section 4.13, Public Health and Safety. Similarly, schools are evaluated as part of Section 4.16, Socioeconomics. Utilities providing public services within the vicinity of the Lease Boundary are identified in Section 3.15. Washington Administrative Code (WAC) 463-60-535(4) requires a review of a proposed facility's impact on utilities.

Section 4.4, Water Resources, evaluates the collection and conveyance of stormwater within the Lease Boundary and Project vicinity. Section 4.7, Energy and Natural Resources, evaluates the supply and demand for electricity and water within the Project vicinity, Benton County, and the State of Washington. Section 4.14, Transportation, evaluates the Project's impact on streets and highways. Section 4.13, Public Health and Safety, evaluates the Project's impact on law enforcement and emergency response agencies. The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and summarized in **Table 4.15-1**.

Table 4.15-1: Impact Rating Table for Public Services and Utilities from Section 4.1

Factor	**Rating** →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Table 4.15-2 describes the intended framework for using the magnitude rankings in the evaluation of impacts on public services and utilities.

Table 4.15-2: Criteria for Assessing Magnitude of Impacts on Public Services and Utilities

Magnitude of Impacts	Description
Negligible	**Level of Service:** Changes in the level of service would be either non-detectable or, if detected, would have no noticeable impact on a public utility's ability to serve its community or customers. **Safety**: The reduction in the level of service would not alter existing risks to human health.
Low	**Level of Service:** Changes in the level of service would be measurable, but the changes would be small and localized and would not inhibit a public utility's ability to serve its community or customers. **Safety:** The reduction in the level of service would not noticeably alter the existing risk to human health or community cohesion.
Medium	**Level of Service:** Changes in the level of service would be measurable and would interrupt the public's use of the utility and resource. **Safety:** The reduction in the level of service would increase risks to human health; however, fatalities would not be expected to occur and community cohesion would remain unchanged.
High	**Level of Service:** Changes in resource availability would be readily measurable and would have substantial consequences on local or regional populations. **Safety:** The reduction in the level of service would cause an increased risk to human health that could result in fatality, and a breakdown of community cohesion would be noticeable.

4.15.1 Method of Analysis

For this discussion, the Project's impact on public services and utilities is evaluated through an analysis of sewage and solid waste collection and treatment. Horse Heaven Wind Farm, LLC's (Applicant) Application for Site Certification (ASC) presents information on potential waste streams and disposal options for the Project's construction, operations, and decommissioning stages. An adverse impact on sewage and solid waste management would occur if the Project would cause one of the following scenarios:

- Violation of an existing regulation
- Decrease in the existing level of service provided by a utility
- Decrease in the capacity of a utility to service its community

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in Appendix A (Decommissioning Plan) of the ASC (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on public services and utilities are discussed in Section 2.1.3 and summarized below.

- Turbine blades would be cut down or dismantled into smaller sections for transport by regular-sized haul trucks.
- Turbines would be refurbished and resold or recycled.

- All recyclable materials such as copper wiring or other metals would be transported to approved locations for recycling.
- Clean concrete[65] would be crushed and disposed of offsite and/or recycled and reused on site or off site.
- Modules would be dismantled and packaged per manufacturer or approved recycler specifications and shipped to an approved off-site recycler.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.15.2.5, Post-Adjudication Applicant Commitments.

Planning Analysis

A consistency determination summarizes whether a proposed action would be undertaken in a manner that is consistent with enforceable policies of a government-approved management program. **Table 4.15-3** presents a comparison of the Project and the relevant goals and policies of the Benton County Comprehensive Plan's utilities element (UE) and the 2013 Update Benton County Solid Waste and Moderate Risk Waste Plan (referred to herein as the Benton County Plans) (Benton County 2014, 2022).

Table 4.15-3: Comparison of the Project with Benton County Plans

Applicable Plan	Goal/Policy	Analysis
Benton County Comprehensive Plan	**UE Goal 1**: Ensure utilities support the land use and economic development goals of the County	It is anticipated that the Project would be consistent with UE Goal 1 as it is in alignment with the following Benton County land use and economic development goals: ▪ Land Use Goal 5: Identify the location, site planning, and density of new non-farm development outside of UGAs to protect existing agriculture from incompatible adjacent land uses. ▪ Land Use Goal 5 Policy 1: Establish compatible land uses adjacent to areas designated as GMA Agriculture to minimize conflicts associated with farm activities such as spray, dust, noise, odors, and liability. ▪ Economic Development Goal 2: Expand employment opportunities in unincorporated Benton County.
Benton County Comprehensive Plan	**UE Goal 2**: Maintain public and private household water and sewer systems that are consistent with the rural character of the County	It is anticipated that the Project would be consistent with UE Goal 2 as wastewater from the Project's O&M facilities would be discharged to an on-site septic system. The Benton-Franklin Health District is responsible for permitting, overseeing the design and installation of, and inspecting septic systems with wastewater flows less than 3,500 gallons per day. For wastewater flows more than 3,500 gallons, the Applicant would have to obtain approval from the Washington State Department of Health.

[65]Contain an aggregated weight of less than 1 percent of adherent fines, vegetable matter, plastics, plaster, paper, gypsum board, metals, fabrics, wood, tile, glass, asphalt (bituminous) materials, brick, porcelain or other deleterious substance(s) not otherwise noted. Be free of components such as chlorides and reactive materials that are detrimental to the concrete, unless mitigation measures are taken to prevent recurrence in the new concrete (WSDOT 2022).

Table 4.15-3: Comparison of the Project with Benton County Plans

Applicable Plan	Goal/Policy	Analysis
Benton County Comprehensive Plan	**UE Goal 3**: Facilitate efficiency in utility land use and development	It is anticipated that the Project would be consistent with UE Goal 3 as most of the proposed transmission line route occurs on private property, where ongoing agricultural activity would occur along the corridors. Proposed transmission lines would be located adjacent and parallel to existing public road right-of-way where possible. The Project's transmission line corridor would accommodate multiple land uses, including utilities and agricultural uses. The eastern Project substation would be located adjacent to the BPA proposed Bofer Canyon substation, thereby eliminating the need for new transmission lines at this location.
Benton County Comprehensive Plan	**UE Goal 3 Policy 2**: Encourage multiple uses, including passive recreational use, in utility corridors where practical	It is anticipated that the Project would be consistent with UE Goal 3 Policy 2 as passive recreational uses within the proposed transmission line corridor would be possible on DNR land where practical. Additionally, the right-of-way for the transmission line would not be fenced.
Benton County Comprehensive Plan	**UE Goal 3 Policy 3**: Facilitate maintenance and rehabilitation of existing utility systems and facilities and encourage the use of existing transmission/distribution corridors	It is anticipated that the Project would be consistent with UE Goal 3 Policy 3 as the eastern Project substation has been located adjacent to BPA's proposed Bofer Canyon substation, thereby eliminating the need for new transmission lines at this location. Proposed transmission lines would be located adjacent to and parallel existing public road right-of-way where possible.
Benton County Comprehensive Plan	**UE Goal 4**: Develop and adopt provisions as necessary that support future demand for alternative energy vehicles.	It is anticipated that the Project would be consistent with UE Goal 4 as it would not prevent or discourage the support of alternative energy vehicles.
Benton County Comprehensive Plan	**UE Goal 4 Policy 1**: Permit electric vehicle charging stations equipped with slow and medium speed charging equipment as an accessory or ancillary use to any principal use in all zoning districts.	It is anticipated that the Project would be consistent with UE Goal 4 Policy 1 as the project would not prevent Benton County from permitting the installation of charging stations equipped with slow and medium speed charging equipment in districts zoned Growth Management Act Agricultural.

Table 4.15-3: Comparison of the Project with Benton County Plans

Applicable Plan	Goal/Policy	Analysis
Benton County Comprehensive Plan	**UE Goal 4 Policy 2**: Allow electric vehicle “rapid charging stations” designation in commercial, industrial, and agricultural zones as regulated in the zoning code and exclude in areas identified as critical resource areas.	It is anticipated that the Project would be consistent with UE Goal 4 Policy 2 as it would not prevent Benton County from permitting the installation of rapid charging stations in districts zoned Growth Management Act Agricultural.
2013 Benton County Solid Waste and Moderate Risk Waste Plan	**Goal #2**: Continue developing solid waste programs and projects that promote and maintain a high level of public health and safety which protects the human and natural environment of Benton County	It is anticipated that the Project would be consistent with Goal 2 as the Applicant’s ASC states that any oily waste, rags, or dirty or hazardous solid waste would be collected in sealable drums at the construction yards, to be removed for recycling or disposal by a licensed contractor. During operation, there would be no substantial quantities of fuels, oils, or chemicals on site, except as contained in qualified oil-filled equipment, including the turbine gearboxes, substation transformers, and inverter station transformers within the solar array, and the sulfuric acid contained in the lead-acid batteries.
2013 Benton County Solid Waste and Moderate Risk Waste Plan	**Goal #3**: Manage solid wastes in a manner that promotes, in order of priority: waste reduction, reuse, and recycling, with source separation of recyclables as the preferred method	It is anticipated that the Project would be consistent with Goal #3 as the Applicant’s ASC states that operation and maintenance of the Project is expected to generate approximately one or two dumpsters of waste per week at the O&M facilities. All waste would be stored within designated temporary waste collection areas until it is collected for transport to an approved landfill. Materials that can be recycled would be stored and transported separately.

Sources: Benton County 2014, 2022; Horse Heaven Wind Farm, LLC 2022
Applicant = Horse Heaven Wind Farm, LLC; ASC = Application for Site Certification; BPA = Bonneville Power Administration; DNR = Washington State Department of Natural Resources; GMA = Growth Management Act; O&M = Operations and Maintenance; UE = utilities element; UGA = urban growth area

Available Capacity

The Project’s construction, operations, and decommissioning stages would increase demand for sewage treatment and solid waste disposal services in Benton County. **Table 4.15-4** shows the waste streams that would be generated within the Lease Boundary and Benton County’s capacity to accommodate Project-generated increases in sewage and solid waste disposal.

4.15.2 Impacts of Proposed Action

This subsection evaluates potential impacts from the construction, operations, and decommissioning stages of the Project on sewage and solid waste treatment facilities and waste management plans. The discussion of direct impacts on sewage and solid waste treatment facilities focuses primarily on the service providers’ ability to accommodate increased demand throughout the Project’s lifecycle.

As noted in Section 3.15, several companies supply local, long-distance, and cellular telecommunications service in Benton County. Similarly, several companies provide television and internet services throughout the county. As a result of the abundance of available telecommunications options, it is anticipated that the Project would have no impact on the level of service provided to Benton County’s homes and businesses.

Indirect impacts on the collection and treatment of sewage and solid waste are not anticipated because the Project is not expected to substantially induce regional growth (Horse Heaven Wind Farm, LLC 2022). For instance, the projected on-site workforce for the operations stage of the Project is expected to be 16 to 20 full-time employees.

Table 4.15-4: Summary of Waste Streams within the Lease Boundary

Waste Stream	Project Stage	Project Requirements	Disposal Capacity
Sewage and Wastewater	Construction	Construction workers would generate additional quantities of sewage from the use of temporary accommodations.	Sewage would be removed by a licensed hauler and disposed of at an existing municipal sewage treatment facility or otherwise disposed of in accordance with applicable state and local laws and regulations. For instance, of the multiple disposal options that exist within Benton and Franklin Counties, the Kennewick Wastewater Treatment Plant alone receives 5.35 million gallons per day of wastewater per day.
	Operations	Less than 5,000 gallons per day for kitchen and bathroom use.	Wastewater from the O&M facilities would be discharged to an on-site septic system(a)
	Decommissioning	Construction workers would generate additional quantities of sewage from the use of temporary accommodations.	Sewage would be removed by a licensed hauler and disposed of at an existing municipal sewage treatment facility or otherwise disposed of in accordance with applicable state and local laws and regulations.
Industrial Wastewater	Construction and Operations	The Project would not generate industrial wastewater.	Not Applicable
Municipal Solid Waste (MSW)	Construction	The Project's construction would involve disposal of various quantities of non-hazardous construction wastes, including wood, concrete, plastics, metal, glass, insulation, and paper products.	Columbia Ridge Landfill has a permitted remaining capacity of approximately 329 million tons; Finley Buttes Landfill has an estimated available fill capacity of approximately 130 million tons of MSW.
	Operations	Operation and maintenance of the Project is expected to generate approximately one or two dumpsters of non-hazardous waste per week at the O&M facilities.	
	Decommissioning	Various quantities of non-hazardous decommissioning wastes, including wood, concrete, plastics, metal, glass, insulation, and paper products.	

Table 4.15-4: Summary of Waste Streams within the Lease Boundary

Waste Stream	Project Stage	Project Requirements	Disposal Capacity
Energy Storage Batteries[b]	Operations	Final design would determine the required number of lithium-ion batteries necessary to construct the facility's BESS. Lithium-ion batteries have a typical lifespan of 5 to 10 years and will experience a gradual degradation of performance over that time.	
	Decommissioning	Based on the BESS design requirements.	

Sources: Clark County 2015; Waste Management 2019; Benton County 2021; Horse Heaven Wind Farm, LLC 2022

(a) The Application for Site Certification does not provide an exact amount that would be discharged to the on-site septic system but stated that it would be less than 5,000 gallons per day.

(b) The Applicant has not yet chosen the specific type or manufacturer of the energy storage batteries and related equipment nor made a commitment to repurpose or recycle the BESS. BESS can either be repurposed for second-life uses or can be sent back to the original manufacturer or a licensed recycler to recover precious metals and other materials (Taylor et al. 2021).

BESS = battery energy storage facility; MSW = municipal solid waste; O&M = operations and maintenance

4.15.2.1 Impacts during Construction

The temporary increase in population during construction would generate additional quantities of wastewater from the use of temporary accommodations. The ASC states that temporary portable sanitary facilities provided for construction crews would be adequate to support expected on-site personnel and would be removed at completion of construction activities. Wastewater generated in association with these facilities would be periodically removed by a licensed hauler and disposed of at an existing municipal sewage treatment facility or otherwise disposed of in accordance with applicable state and local laws and regulations (Horse Heaven Wind Farm, LLC 2022).

Project construction typically generates a variety of non-hazardous construction wastes, including wood, concrete, plastics, metal, glass, insulation, and paper products. Concrete that accumulates in the concrete washout area, along with any other material not suitable to be left in place, would be allowed to harden and then removed from the site. Additional construction wastes would include erosion control materials, such as straw bales and silt fencing, and electrical equipment.

Turbine Option 1

Construction activities under Turbine Option 1 would result in a low, short-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on municipal solid waste (MSW) management. The permanent disposal of MSW in a managed landfill would represent a duration ranking of “constant.” The following summarizes Project conditions that would impact wastewater flows generated during construction under Turbine Option 1:

- The Applicant anticipates that the maximum on-site workforce throughout the duration of the construction stage would be 467 temporary employees.
- The Applicant estimates that the Project’s construction workforce would consist of 60 percent local hires.
- The Washington State Department of Health states that the typical person in the United States generates an average daily wastewater flow of approximately 50 to 70 gallons (Washington State Department of Health 2002).
  - Based on the typical person’s average daily waste flow, the maximum amount of wastewater flows generated during the Project’s construction stage would be less than 32,690 gallons.
- For comparison, the Kennewick Wastewater Treatment Plant receives 5.35 million gallons of wastewater per day.
- Because 60 percent of the construction workforce would be sourced locally, the waste quantities stated in the region’s waste management plans would include those generated by most of the Project’s workforce.

As noted in **Table 4.15-4**, solid waste from the Project’s construction would consist of various quantities of non-hazardous construction wastes. The landfills identified in the ASC maintain substantial capacity that would be sufficient to serve the Project and the region, simultaneously. A typical weight allowance for an 8-yard dumpster is 1,800 lbs. or 0.9 tons (Waste Management 2023). If the Project’s Operations and Management facility fills up to 2 dumpsters per week, the Proposed Action would only produce 93.6 tons of MSW per year. For comparison, Benton County is expected to generate 326,505 tons of MSW in 2025.

An impact on human health and wellbeing could occur if the construction of Turbine Option 1 limited the availability of potable water to surrounding communities or reduces a community's ability to manage wastewater or MSW. During the construction of Turbine Option 1, existing infrastructure (e.g., water treatment facilities, sewer systems, and landfills) and regulations governing the disposal of wastewater and MSW would minimize impacts from the use of water, production of wastewater, and disposal of MSW to human health and well being. Impacts on safety would result in a negligible, temporary to constant, unlikely, limited to regional impact.

Turbine Option 2

Construction activities under Turbine Option 2 would result in a low, short-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact MSW management. Impacts on wastewater and MSW management resulting from construction under Turbine Option 2 would be similar to those presented for Turbine Option 1. Impacts from the use of water and generation of wastewater and MSW to human health and wellbeing during the construction of Turbine Option 2 would be similar to those presented for Turbine Option 1. Impacts on human health and wellbeing would result in a negligible, temporary to constant, unlikely, limited to regional impact.

Solar Arrays

Construction activities for the solar arrays would result in a low, short-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional MSW management. Impacts on wastewater and MSW management resulting from construction of solar arrays would be similar to those presented for Turbine Option 1. Impacts from the use of water and generation of wastewater and MSW to human health and wellbeing during the construction of solar arrays would be similar to those presented for Turbine Option 1. Impacts on human health and wellbeing would result in a negligible, temporary to constant, unlikely, limited to regional impact.

Battery Energy Storage Systems

Construction activities for battery energy storage systems (BESS) would result in a low, short-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management. Impacts on wastewater and MSW management resulting from construction of BESS would be similar to those presented for Turbine Option 1. Impacts from the use of water and generation of wastewater and MSW to human health and wellbeing during the construction of BESS would be similar to those presented for Turbine Option 1. Impacts on human health and wellbeing would result in a negligible, temporary to constant, unlikely, limited to regional impact.

Substations

Construction activities for substations would result in a low, short-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact MSW management. Impacts on wastewater and MSW management resulting from construction of substations would be similar to those presented for Turbine Option 1. Impacts from the use of water and generation of wastewater and MSW to human health and wellbeing during the construction of substations would be similar to those presented for Turbine Option 1. Impacts on human health and wellbeing would result in a negligible, temporary to constant, unlikely, limited to regional impact.

Comprehensive Project

Construction activities for the comprehensive Project would result in a low, short-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management. Impacts on wastewater and MSW management resulting from construction of the comprehensive Project would be similar to those presented for Turbine Option 1. Impacts from the use of water and generation of wastewater and MSW to human health and wellbeing during the construction of the comprehensive Project would be similar to those presented for Turbine Option 1. Impacts on human health and wellbeing would result in a negligible, temporary to constant, unlikely, limited to regional impact.

4.15.2.2 Impacts during Operation

The on-site workforce for the operations stage of the Project is estimated to be between 16 and 20 full-time employees. Wastewater from the O&M facilities would be discharged to an on-site septic system. It is anticipated that the operations stage would use less than 5,000 gallons of water per day and that wastewater would be generated from kitchen and bathroom use.

Operation of the Project is expected to generate approximately one or two dumpsters of waste per week at the O&M facilities. All waste would be stored within designated temporary waste collection areas until it is collected for transport to an approved landfill. Materials that can be recycled would be stored and transported separately.

Turbine Option 1

It is anticipated that operation of the turbines under Turbine Option 1 would have a low, long-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management during the Project's operations stage. It is anticipated that O&M facilities that would support turbine operations under Turbine Option 1 would use less than 5,000 gallons of water per day for kitchen and bathroom use. Wastewater associated with turbine operation under Turbine Option 1 would be discharged to an on-site septic system. The Benton-Franklin Health District is responsible for permitting, overseeing the design and installation of, and inspecting on-site septic systems with wastewater flows less than 3,500 gallons per day. For wastewater flows of more than 3,500 gallons, the Applicant would have to obtain approval from the Washington State Department of Health. Operation of the Project is expected to generate approximately one or two dumpsters of waste per week at the O&M facilities.

Turbine Option 2

O&M activities under Turbine Option 2 would result in a low, long-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management. Impacts on wastewater and MSW management resulting from turbine operations under Turbine Option 2 would be similar to those presented for Turbine Option 1.

Solar Arrays

O&M activities for the solar arrays would result in a low, long-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management. Impacts on wastewater and MSW management resulting from operation of the solar arrays would be similar to those presented for Turbine Option 1. Solar modules would be washed once per year during operations. Water used for solar panel washing would be allowed to infiltrate into the ground. The Applicant has not proposed treatment for solar panel wash water.

Battery Energy Storage Systems

Impacts on wastewater and MSW management resulting from operation of the BESS would be similar to those presented for Turbine Option 1. O&M activities for the BESS would result in a low, long-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management.

Substations

Impacts from substations to wastewater and MSW management would be similar to those presented for Turbine Option 1. O&M activities for the substations would result in a low, long-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management.

Comprehensive Project

Combined impacts on wastewater and MSW management resulting from operation of all Project components would be similar to those presented for Turbine Option 1. O&M activities for the comprehensive Project would result in a low, long-term, unavoidable, local impact on wastewater and a low, constant, unavoidable, local to regional impact on MSW management.

4.15.2.3 Impacts during Decommissioning

Decommissioning would be performed in accordance with the Washington Energy Facility Site Evaluation Council (EFSEC) rules and prior Site Certification Agreements and would comprise of dismantling and removing aboveground improvements, including turbines and solar modules, step-up transformers, substations, BESS, overhead generator tie lines and support structures, control hardware, and meteorological towers. Foundations would be removed to a level of no less than 3 feet below the surface of the ground unless requested to be maintained by the landowner. Cables, lines, and conduit that are buried more than 3 feet below grade may be abandoned in place.

As part of the decommissioning process, the Applicant would repurpose or reuse the Project's high-value components. Recyclable materials would be reduced to a transportable size and removed from the site to an appropriately designated recycling center. Unsalvageable material would be reduced to a transportable size and removed from the site and permanently disposed of in accordance with local, state, and federal solid waste regulations.

Turbine Option 1

Impacts on wastewater during decommissioning of turbines under Turbine Option 1 would be similar to those described for construction under Turbine Option 1. Decommissioning activities under Turbine Option 1 would result in a low, short-term, unavoidable, local impact on wastewater management. Demolition workers would each generate 50 to 70 gallons of wastewater per day that would require collection and disposal. Decommissioning activities under Turbine Option 1 would result in a low, constant, unavoidable, local to regional impact on MSW management. Generation and disposal of solid waste during the decommissioning stage for turbines under Turbine Option 1 would comprise the following:

- The blades would be cut down or dismantled into smaller sections for transport by regular-sized haul trucks.
- Turbines would be refurbished and resold or recycled.
- Turbine foundations would be removed to a depth of not less than 3 feet.
  - The concrete would be reduced in size by excavator attachments and transported for disposal off site.
- The meteorological towers would also be removed in a fashion similar to the turbines.
- Any geotextile fabric encountered during demolition would be taken to an approved landfill.
- All underground collection lines buried above not less than 3 feet below the surface would be removed.

- The cables would be cut into manageable sections and removed from the site.
- All recyclable materials such as copper wiring or other metals would be transported to approved locations for recycling.

■ Pad-mounted transformers would be hauled off site for disposal.

■ Concrete pads would be reduced in size by excavator attachments and transported for disposal off site.

As shown in **Table 4.15-4**, the ASC has identified landfills that have permitted lifespans greater than the estimated 35-year operations stage of the Project. Additionally, the landfills have a projected capacity sufficient to receive solid waste generated during the decommissioning stage of Turbine Option 1.

Turbine Option 2

Impacts on wastewater and MSW management from the decommissioning of turbines under Turbine Option 2 would be similar to those presented for Turbine Option 1. Decommissioning activities under Turbine Option 2 would result in a low, short-term, unavoidable, local impact on wastewater management. Decommissioning activities under Turbine Option 2 would result in a low, constant, unavoidable, local to regional impact on MSW management.

Solar Arrays

Decommissioning activities for the solar arrays would result in a low, short-term, unavoidable, local impact on wastewater management. Decommissioning activities for solar arrays would result in a low, constant, unavoidable, local to regional impact on MSW management. Generation and disposal of solid waste during the decommissioning stage for the solar array infrastructure are described below:

■ The panels used in the Project would contain silicon, glass, and aluminum, which are recyclable. Modules would be dismantled and packaged per manufacturer or approved recycler specifications and shipped to an approved off-site recycler.

■ Control cabinets, electronic components, and internal cables would be removed as part of the decommissioning stage. The panels, racks, and inverters would be transported whole for reconditioning and reuse or disassembled or cut into more easily transportable sections for salvageable, recyclable, or disposable components.

■ Pads would be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable, and concrete to a depth of not less than 3 feet below grade.
  - The cables would be cut into manageable sections and removed from the site.
  - All recyclable materials such as copper wiring or other metals would be transported to approved locations for recycling.
  - All wire would be sent to an approved recycling facility.

■ Concrete slabs used as equipment pads would be broken and removed to a depth of not less than 3 feet below grade. Clean concrete would be crushed and disposed of off site and/or recycled and reused on site or off site.

- All racking and fencing material would be broken down into manageable units, removed from the facility, and sent to an approved recycler.

As shown in **Table 4.15-4**, the ASC has identified landfills that have permitted lifespans greater than the estimated 35-year operations stage of the Project. Additionally, the landfills have a projected capacity sufficient to receive solid waste generated during the decommissioning stage of the solar arrays.

Battery Energy Storage Systems

Decommissioning activities for the BESS would result in a low, short-term, unavoidable, local impact on wastewater management. Decommissioning activities for BESS would result in a low, constant, unavoidable, local to regional impact on MSW management. Generation and disposal of solid waste during the decommissioning stage for the BESS infrastructure are described below:

- All aboveground structures, including the conductors, switches, transformers, fencing, and other components, would be dismantled and removed from the site.
- All recyclable materials such as copper wiring or other metals would be transported to approved locations for recycling.
- Batteries would be recycled if feasible and otherwise would be transported to an approved disposal facility.
- Concrete slabs used as equipment pads would be broken and removed to a depth of not less than 3 feet below grade. Clean concrete would be crushed and disposed of off site and/or recycled and reused on or off site.

As shown in **Table 4.15-4**, the ASC has identified landfills that have permitted lifespans greater than the estimated 35-year operations stage of the Project. Additionally, the landfills have a projected capacity sufficient to receive solid waste generated during the decommissioning stage of the BESS.

Substations

Decommissioning activities for the substations would result in a low, short-term, unavoidable, local impact on wastewater management. Decommissioning activities for substations would result in a low, constant, unavoidable, local to regional impact on MSW management. Generation and disposal of solid waste during the decommissioning stage for substations are described below:

- Conductors, switches, transformers, fencing, and other components would be dismantled and removed from the site.
- All recyclable materials such as copper wiring or other metals would be transported to approved locations for recycling. All wire would be sent to an approved recycling facility.
- Concrete slabs used as equipment pads would be broken and removed to a depth of not less than 3 feet below grade. Clean concrete would be crushed and disposed of off site and/or recycled and reused on site or off site.

As shown in **Table 4.15-4**, the ASC has identified landfills that have permitted lifespans greater than the estimated 35-year operations stage of the Project. Additionally, the landfills have a projected capacity sufficient to receive solid waste generated during the decommissioning stage of the substations.

Comprehensive Project

Impacts on wastewater and MSW management from decommissioning of the comprehensive Project would be similar to those presented for each component. Decommissioning activities for the comprehensive Project would result in a low, short-term, unavoidable, local impact on wastewater management. Decommissioning activities for the comprehensive Project would result in a low, constant, unavoidable, local to regional impact on MSW management.

4.15.2.4 Recommended Mitigation Measures

This section describes the measures that would reduce or compensate for impacts related to public services and utilities from construction, operation, and decommissioning of the Project. These measures would be implemented in addition to compliance with the environmental permits, plans, and authorizations required for the Proposed Action.

Section 4.7 (Energy and Natural Resources) presents a list of recommended mitigation measures that would apply to decommissioning impacts on public services and utilities resulting from the Project:

ENR-5:[66] The Applicant would capture and recycle wash water to reduce the Project's water requirements during the operations stage.

Rationale: This mitigation measure reduces the Project's demands on water resources.

ENR-7: To minimize the need for future extraction of natural resources, the Applicant would recycle all components of the Project that have the potential to be used as raw materials in commercial or industrial applications.

Rationale: This mitigation measure reduces the Project's demands on natural resources as well as, reduces the amount of solid waste that would go into the area's landfills.

Additionally, EFSEC has identified the following mitigation measure that addresses the disposal of non-recyclable project components:

PSU-1:[67] To address the potential for the inappropriate disposal of Project waste, the Applicant would dispose of all non-recyclable Project components in an appropriately licensed waste disposal facility.

Rationale: This mitigation measure prevents disposal of Project-related wastes in inappropriate landfills or unauthorized facilities.

4.15.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-

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[66] ENR-: Identifier of numbered mitigation item for Energy and Natural Resources, as described in Section 4.7

[67] PSU-: Identifier of numbered mitigation item for Public Services and Utilities

recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes, and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and consider underground of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[68]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS

[68] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remain. The additional Applicant commitments identified above do not change the impact ratings previously provided for public services and utilities in the Draft EIS, and the impact ratings remain the same.

4.15.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depend on the magnitude and duration of an impact. “Significant” in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

This Environmental Impact Statement weighs the potential impacts on public services and utilities that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.15-5a, 4.15-5b, and 4.15-5c**. As shown in the impact summary tables below, EFSEC has determined that no significant unavoidable adverse impacts would occur to public services and utilities.

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Table 4.15-5a: Summary of Potential Impacts on Public Services and Utilities during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Wastewater (Level of Service and Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The amount of wastewater produced from the maximum number of temporary workers on site (467), while measurable, would not impact the ability of the local utility to treat the community's sewage.	Low	Short Term	Unavoidable	Local	No mitigation identified	None identified
Municipal Solid Waste (Level of Service)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Solid waste from the Project's construction would consist of various quantities of non-hazardous construction wastes. The landfills identified in the ASC maintain substantial capacity that would be sufficient to serve the Project and the region, simultaneously.	Low	Constant	Unavoidable	Local to Regional (depending on location of landfill)	**ENR-7:** Recycle all applicable components **PSU-1:** Use of a licensed waste disposal facility	None identified
Potable Water (Level of Service and Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The impact on human health and wellbeing would result from a reduction in potable water in the surrounding community or the capability to manage wastewater and construction debris.	Negligible	Temporary (accident) Constant (storage)	Unlikely	Limited to Regional (depending on location of disposal facility)	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
ASC = Application for Site Certification; BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.15-5b: Summary of Potential Impacts on Public Services and Utilities during Operation of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Wastewater (Level of Service and Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Wastewater from the O&M facilities would be discharged to an on-site septic system. It is anticipated that the operations stage would use less than 5,000 gallons of water per day and that wastewater would be generated from kitchen and bathroom use.	Low	Long Term	Unavoidable	Local	**ENR-5:** Capture and recycle wash water	None identified
Municipal Solid Waste (Level of Service)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Operation of the Project is expected to generate approximately one or two dumpsters of waste per week at the O&M facilities.	Low	Constant	Unavoidable	Local to Regional (depending on location of landfill)	**PSU-1:** Use of a licensed waste disposal facility	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; O&M = operations and maintenance

Table 4.15-5c: Summary of Potential Impacts on Public Services and Utilities during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Wastewater (Level of Service and Safety)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The amount of wastewater produced from the temporary workers on site, while measurable, would not impact the ability of the local utility to treat the community's sewage.	Low	Short Term	Unavoidable	Local	No mitigation identified	None identified
Municipal Solid Waste (Level of Service)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	After dismantling of the facility, high-value components would be removed for scrap value. The remaining materials would be reduced to transportable size and removed from the site for disposal. Existing facilities would maintain capacity to receive the Project's non-recyclable waste and continue to serve their communities.	Low	Constant	Unavoidable	Local to Regional	**ENR-7**: Recycle all applicable components **PSU-1**: Use of a licensed waste disposal facility	None identified

Notes:
[a] The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
[b] Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
[c] Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
[d] Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

4.15.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to public services and utilities from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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4.16 Socioeconomics

This section describes potential impacts on socioeconomics from the proposed Horse Heaven Wind Farm (Project, or Proposed Action) or under the No Action Alternative. Under Washington Administrative Code (WAC) 197-11-448, socioeconomics includes the general welfare, social, and economic conditions that contribute to an area's quality of life. Section 3.16 describes the existing socioeconomic conditions within the vicinity of the Project and within a 1-hour commute of the Lease Boundary. The Project vicinity includes the areas 4 miles south/southwest of the City of Kennewick, Washington, and the larger Tri-Cities urban area along the Columbia River. The study area for socioeconomics includes the area within the Lease Boundary and the populations of Benton, Franklin, Walla Walla, and Yakima Counties.

Sections 3.13 and 4.13, Public Health and Safety focus on the availability of public service agencies and medical facilities (e.g., law enforcement, fire protection, and medical emergency services) within the vicinity of the Lease Boundary. Sections 3.15 and 4.15, Public Services and Utilities focus on utilities that serve the Project vicinity. The qualitative evaluation presented herein relies on the impact scale defined in Section 4.1 and summarized in **Table 4.16-1**.

Table 4.16-1: Impact Rating Table for Socioeconomics from Section 4.1

Factor	Rating →			
Magnitude	**Negligible** indistinguishable from the background	**Low** small impact, non-sensitive receptor(s)	**Medium** intermediate impact, may occur on sensitive receptor(s) or affect public health and safety	**High** large impact on sensitive receptor(s) or affecting public health and safety
Duration	**Temporary** infrequently during any stage	**Short Term** duration of construction or site restoration	**Long Term** during operation or operation plus another stage of Project	**Constant** during life of Project and/or beyond the Project
Likelihood	**Unlikely** not expected to occur	**Feasible** may occur	**Probable** expected to occur	**Unavoidable** inevitable
Spatial Extent/Setting	**Limited** small area of Lease Boundary or beyond Lease Boundary if duration is temporary	**Confined** within Lease Boundary	**Local** beyond Lease Boundary to neighboring receptors	**Regional** beyond neighboring receptors

Table 4.16-2 defines the qualitative framework used herein to rank the magnitude impact. **Table 4.16-2** presents impact magnitude in reference to the three indicators of socioeconomics identified in WAC 197-11-448 as well as a magnitude ranking of environmental justice concerns that could arise from socioeconomic impacts that would disproportionately affect people of color or low-income communities.

Table 4.16-2: Criteria for Assessing Magnitude of Impacts on Socioeconomics

Magnitude of Impacts	Description
Negligible	**General Welfare:**[(a)] No noticeable or quantifiable change in the health, peace, morality, or safety of the study area's residents. **Social Conditions:**[(b)] No noticeable or quantifiable change in healthcare, empowerment, housing, or other programs geared toward assisting the poor, unemployed, and marginalized in society. **Economic Environment:**[(c)] No noticeable or quantifiable change in the external economic factors that influence buying habits of consumers and businesses and therefore affect economic performance locally. **Environmental Justice:** No noticeable impact or quantifiable change in the general welfare, social conditions, or economic environment of people of color or low-income communities.
Low	**General Welfare:** Adverse changes in the health, peace, morality, or safety of the study area's residents would be small and within applicable regulatory standards. **Social Conditions:** Small but measurable adverse changes in healthcare, empowerment, housing, or other programs geared toward assisting the poor, unemployed, and marginalized in society. **Economic Environment:** A reduction in the external economic factors that influence buying habits of consumers and businesses would be small but quantifiable and therefore adversely affect economic performance locally. **Environmental Justice:** Small adverse changes in the general welfare, social conditions, or economic environment of people of color or low-income communities, but their health, safety, and economic security would not be harmed more so than surrounding non-EJ populations.
Medium	**General Welfare:** Adverse changes in the health, peace, morality, or safety of the study area's residents would be intermediate. **Social Conditions:** Intermediate adverse changes in healthcare, empowerment, housing, or other programs geared toward assisting the poor, unemployed, and marginalized in society from historic or existing conditions. **Economic Environment:** Intermediate reduction in the external economic factors that have historically influenced buying habits of consumers and businesses and therefore affect the economic performance locally. **Environmental Justice:** Adverse intermediate changes in the general welfare, social conditions, and economic environment of people of color or low-income communities would occur. Adverse impacts on specific conditions or services may impact people of color and low-income communities more than surrounding non-EJ populations.

Table 4.16-2: Criteria for Assessing Magnitude of Impacts on Socioeconomics

Magnitude of Impacts	Description
High	**General Welfare:** Meaningful decrease in the health, peace, morality, or safety of the study area's residents. **Social Conditions:** Meaningful decrease in healthcare, empowerment, housing, or other programs geared toward assisting the poor, unemployed, and marginalized in society. **Economic Environment:** Meaningful reduction in the external economic factors that influence buying habits of consumers and businesses and therefore affect the performance of the study area. **Environmental Justice:** Low-income and people of color communities would experience meaningful changes in their general welfare, social conditions, or economic environment. Low-income and people of color communities would disproportionately experience adverse changes to their health, safety, or economic security when compared to surrounding non-EJ populations.

Sources:
(a) U.S. Congress n.d.
(b) U.S. Department of Health and Human Services n.d.
(c) Business Development Bank of Canada n.d.

4.16.1 Method of Analysis

This evaluation of socioeconomics is based on existing conditions data that describe the general welfare, social, and economic conditions of the study area and the economic impact analysis presented in Section 3.16 and in the 2022 Application for Site Certification (ASC) for the Project's construction and operations stages. Potential impacts on socioeconomics from the decommissioning stage are estimated based on the economic impact analysis for the construction and operations stages presented in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022).

This evaluation of socioeconomics analyses potential impacts from the Proposed Action in the context of the example phased approach to construction presented by Horse Heaven Wind Farm, LLC (Applicant):

This Environmental Impact Statement (EIS) considers the impact of the Project as a whole. To align the impact rating system described by the Applicant's socioeconomics impact analysis in the 2022 ASC, this evaluation of impacts to socioeconomics analyzes potential impacts from the Proposed Action in the context of the Applicant's example of a phased approach to construction:

- Phase 1 construction could generate power via wind and solar. Phase 1 could also include a battery energy storage system (BESS) capable of storing energy.
- Phase 2 construction is divided into Phase 2a and Phase 2b, summarized as follows:
  - Phase 2a could consist of the construction of both wind and solar facilities. The Applicant's Phase 2a scenario also includes the construction of a BESS.
  - Phase 2b could increase power generation via the construction of additional wind turbines, but construction would not include a BESS.

Chapter 2 contains more information on the Applicant's example of a phased approach to construction. The construction schedule, including phasing of specific elements of the Project, could alter the details of the analysis.

Applicant Commitments

The Applicant has identified measures and/or best practices that are designed to prevent or minimize potential impacts on the affected environment for the Project. Measures presented by the Applicant in the 2022 ASC (Horse Heaven Wind Farm, LLC 2022) and taken into consideration in the characterization of potential impacts on socioeconomics are discussed in Section 2.1.3 and listed below.

- Applicable commitment measures outlined in Sections 4.3, Air Quality; 4.10, Visual Aspects, Light and Glare, 4.11, Noise and Vibration and; and 4.14, Transportation.
- The Applicant intends to develop the Project under a community workforce agreement or project labor agreement; however, reserves the right to use non-organized labor, if necessary.

Post-adjudication Applicant commitments were identified and finalized in the Applicant's Final ASC (Horse Heaven Wind Farm, LLC. 2023). The changes to impact ratings due to these additional Applicant commitments are discussed in Section 4.16.2.5, Post-Adjudication Applicant Commitments.

Economic Impact Analysis

The 2022 ASC assessed economic impacts in terms of employment, labor income, and economic output using the IMPLAN economic modeling package. The Applicant's analysis relied on IMPLAN data from 2019. Impacts are assessed using a multi-county model with data specific to Benton and Franklin Counties. The Applicant provided separate economic analyses for the example phased approach to construction and operations.

Appendix 4.16-1 provides detailed information about the IMPLAN model, Project data used to calculate economic impacts, and estimated economic output data for the Project's construction and operations stages. The IMPLAN model reports economic impacts using output, jobs, and personal income. The economic metrics presented by IMPLAN are defined as follows:

- **Output:** The value of goods and services produced, which serves as a broad measure of economic activity.
- **Jobs:** Measured as the average number of employees engaged in full- or part-time work. For this analysis, model outputs are subsequently adjusted to full-time equivalents (FTEs) using coefficients provided by IMPLAN. Job estimates are presented in FTEs or job-years, with each identified job representing 12 months (2,080 hours) of employment.
- **Personal income (or labor income)**: Expressed as the sum of employee compensation and proprietary income. Project-related personal income may be broken down as follows:
  - Employee compensation (wages) includes workers' wages and salaries, as well as other benefits such as health, disability, and life insurance; retirement payments; and non-cash compensation, expressed as total cost to the employer.
  - Proprietary income (business income) represents the payments received by small-business owners or self-employed workers (Florida State University 2000).

Impact Types

Economic multipliers derived from the IMPLAN model are used to estimate total economic impacts. Total economic impacts consist of three components: direct, indirect, and induced. These three components are described as follows:

- **Direct:** The direct impact component consists of expenditures made specifically for the proposed facility, such as construction labor and materials. These direct impacts generate economic activity elsewhere in the local economy through the multiplier effect, as initial changes in demand "ripple" through the local economy and generate indirect and induced impacts. For the analysis presented in the 2022 ASC, the direct component was based on labor expenditures only and did not include direct expenditures on materials, which are included as part of the indirect impact analysis. Direct impacts could result from increases in population, increased demand for housing, and increased income and jobs added to the local economy (USDA 2003).
- **Indirect:** Indirect impacts are generated by the expenditures on goods and services by suppliers who provide goods and services to a construction project. Indirect effects are often referred to as "supply-chain" impacts because they involve interactions among businesses. For the analysis of the Proposed Action, indirect impacts also include the effects of direct expenditures (i.e., local purchases associated with the project's construction or operaiton) on materials. Indirect impacts could result from increases in indirect and induced income and jobs added to the local economy (USDA 2003).
- **Induced:** Induced impacts are generated by the spending of households associated either directly or indirectly with the proposed facility. Workers employed during construction, for example, will use their income to purchase groceries and other household goods and services. Workers at businesses that supply the facility during construction or operation will do the same. Induced effects are sometimes referred to as "consumption-driven" impacts (USDA 2003).

Environmental Justice

Revised Code of Washington (RCW) 70A.02.010 defines environmental justice (EJ) as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, rules, and policies. EJ includes addressing disproportionate environmental and health impacts in all laws, rules, and policies with environmental impacts by prioritizing vulnerable populations and overburdened communities, the equitable distribution of resources and benefits, and eliminating harm (RCW 70A.02.010).

The U.S. Environmental Protection Agency (EPA) defines the term "fair treatment" to mean that "no group of people, including a racial, ethnic or a socioeconomic group, should bear a disproportionate share of the negative environmental consequences from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies." In implementing its programs, EPA has expanded the concept of fair treatment to include not only consideration of how burdens are distributed across all populations, but the distribution of benefits as well. Disproportionate effects as presented in Executive Order 12898 is described as situations of concern where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations or indigenous peoples (EPA 2020).

Executive Order 12898 addresses people of color populations, low-income populations, and indigenous peoples as population groups of concern in considering potential EJ implications of a regulatory action (EPA 2016). According to the Council on Environmental Quality (CEQ), to be considered an EJ community, a community must have a high percentage of people of color or a significant amount of its population living at or below the poverty level per U.S. Census data. Demographics data can be used to analyze trends to identify potentially disproportionate impacts on low-income and people of color communities (CEQ 1997).

RCW 19.405.020 defines low-income as:

> *Household incomes as defined by the department or commission, provided that the definition may not exceed the higher of eighty percent of area median household income or two hundred percent of the federal poverty level, adjusted for household size.*

Methodology for Evaluating Environmental Justice

This evaluation of socioeconomics applied the federal and state definitions of EJ to the analysis of people of color and low-income communities. Considering the location of the Project, and the fact that Benton County has the lowest percentage of low-income and people of color population, in comparison to other counties within the Project study area, Benton County was selected as a conservative reference community for the analysis of low-income and people of color communities in this study. Therefore, data on people of color and low-income populations in the study area were compared to the population characteristics of Benton County. If the percentage of people of color or low-income populations within the studied census block groups was greater than Benton County, the block group was identified as a people of color and/or a low-income community.

Communities of color were identified using census data for all people who identify as a race other than white alone (e.g., list their ethnicity as Hispanic or Latino). Low-income populations are defined in this report as the percentage of people living at or below twice the federal poverty level. For more information on the definitions of people of color and low-income, and data sources used to identify these communities, refer to Section 3.16.

For the evaluation of EJ in this section, changes in air quality, noise, increased transit times, availability of affordable housing, and losses of income or jobs represent potential impacts on people of color and low-income communities. This does not suggest that other aspects of the natural or built environment don't directly or indirectly impact people of color or low-income communities.

4.16.2 Impacts of Proposed Action

This analysis of potential impacts of the Proposed Action addresses population, economic conditions, housing, and EJ. The economic impact analysis presented in the 2022 ASC indicates that Project-induced economic activity is not expected to result in indirect population growth or a related demand for housing capacity (Horse Heaven Wind Farm, LLC 2022).

The Project would generate both direct and indirect impacts on local tax revenues. Indirect impacts on the region's general welfare from potential changes in air quality, health and safety, and transportation are evaluated in Sections 4.3, 4.13, and 4.14, respectively. The following summarizes the study area with regards to the CEQ EJ definition for low-income and people of color communities, as well as low-income communities as described in RCW 19.405.020:

- Communities with a population of people of color higher than 50 percent are located in Franklin County (54 percent Hispanic alone / 59 percent All People of Color) and Yakima County (51 percent Hispanic alone / 57 percent All People of Color) (Table 3.16-2).
- While white alone represents the majority population in the six census block groups that intersect with or are adjacent to the Project Lease Boundary, minority populations make up meaningful percentages of the

respective communities. The percentage of people of color for the six census block groups together (18 percent) is well below the identified threshold for this analysis (29 percent). However, Census Tract 116, Census Block Group 1, is an identified community of color because the percentage of people of color in this block group (45 percent) is greater than the percentage of people of color in the identified reference community, Benton County (29 percent) (see Section 3.16 for additional details).

- Census Tract 116, Block Group 1, spans a very large area, with majority of it outside the Project Lease Boundary. This census block group is among the least populated of the six census block groups, and it is the largest block group that intersects the Project Lease Boundary. Based on the review of the aerial imagery, this block group contains very little built-up development in the form of dispersed housing. In addition, the proximity values to other EJ indicators, such as superfund sites, traffic, and hazardous waste, are low in this area.
- The percentage of low-income population in all four counties within the study area is higher than the percentage of low-income population in the State of Washington as a whole (24 percent). Yakima County, with 43 percent, has the highest, and Benton County, with 26 percent, has the lowest percentage of low-income individuals in the study area (Table 3.16-5).
- The percentage of low-income population in Benton County (26 percent) is 2 percent higher than the percentage of low-income population in Washington State (24 percent). As stated in Section 4.16.1, Benton County is the reference community for the analysis of low-income within the census block groups that intersect with or are located adjacent to the Project Lease Boundary.
- The low-income population in Census Tract 115.01 Block Group 1, with 41 percent low-income, and Census Tract 118.01, Block Group 3, with 31 percent low-income, are higher than the low-income population of the reference community (Benton County with 26 percent) (Table 3.16-4).
- While the percentage of low-income population for the six census block groups together (14 percent) is well below the identified low-income threshold for this analysis (26 percent), Census Tract 115.01, Block Group 1 and Census Tract 118.01, Block Group 3, with 41 percent and 31 percent of low-income population, respectively, exceed the low-income threshold (26 percent) and are identified as low-income communities (refer to Section 3.16 for additional details).
- Census Tract 115.01, Block Group 1 is the only census block group (among the six) that is completely outside the Project Lease Boundary but is located adjacent to the Project Lease Boundary (Figure 3.16-2). This census block group is also among the least populated block groups (1,077 individuals for whom income status is determined). Review of aerial imagery indicated a low amount of built-up development in the majority of the areas within this census block group. Proximity values to other EJ indicators, such as superfund sites, traffic, and hazardous waste, are low for this census block group.
- Census Tract 118.01, Block Group 3 is the second largest census block group (after Census Tract 116, Block Group 1) that intersects with the Project Lease Boundary. Compared to other block groups, Census Tract 118.01, Block Group 3 has the lowest population of individuals for whom income status is determined (see Section 3.16 for details). Large portions of this block group are located outside of the Project Lease Boundary. Review of aerial imagery indicated there is a very low amount of built-up development and this census block group is characterized by its scattered dispersed housing. Also, as demonstrated in Appendix

3.16-A, proximity values to other EJ indicators, such as superfund sites, traffic, and hazardous waste are low for this census block group.

4.16.2.1 Impacts during Construction

According to the 2022 ASC, the largest share of the overall construction cost of wind-energy-generating facilities consists of the purchase and transportation of equipment (e.g., turbines, blades, and towers) to the Project site. Similarly, Project-related materials and equipment such as solar modules, inverters, BESS, electrical components, and mountings account for the largest share of the overall construction cost for solar facilities. The Applicant anticipates acquiring these technical project components outside the study area (Horse Heaven Wind Farm, LLC 2022).

Economic Conditions

Construction Expenditures

Construction expenditures are the money spent or allocated to the cost of real property. This includes the cost of constructing or making improvements to real property. The Applicant anticipates that the following construction expenditures would occur in the study area:

- **Balance of Plant for Wind Turbines**. Local expenditures are expected to include everything but the actual wind turbines (e.g., concrete, rebar, and other construction materials; electrical components; and cabling required to prepare the sites).
- **Balance of System for Solar Arrays**. Local expenditures are expected to include everything but the actual solar array (e.g., concrete, rebar, and other construction materials; electrical components; and cabling required to prepare the sites) (Horse Heaven Wind Farm, LLC 2022).

The Applicant's economic impact analysis states that other expenditures expected to occur in the study area include those related to engineering, legal services, substation and transmission line construction, and operations and maintenance (O&M) building construction. Of these local expenditures, the Applicant anticipates that upgrades to the Bonneville Power Administration network would need to occur to accommodate the energy that would be generated by the Project (Horse Heaven Wind Farm, LLC 2022).

The 2022 ASC concludes that installation labor-related expenditures that occur in the counties within the study area would result in economic impacts elsewhere in the local economy. For instance, workers temporarily relocating to the Project vicinity for the duration of their on-site employment would spend per diem money throughout the study area on food, lodging, and clothing (Horse Heaven Wind Farm, LLC 2022).

Fiscal Impact

The fiscal impact analysis prepared as part of the 2022 ASC estimated local tax revenues that would be expected to accrue as a result of the Project's construction. Sales and use tax revenues from construction would be one-time revenues generated during the Proposed Action's construction stage.

Sales and Use Tax

Tax imposed under RCW 82.08.020 does not apply to the sales of machinery and equipment used directly in generating electricity from renewable sources or to sales of or charges made for labor and services rendered in respect to installing such machinery and equipment. The economic impact analysis presented in the 2022 ASC assumed that procurements subject to state and local sales tax are limited to items not used directly to generate electricity. The exemption may be claimed in the form of a sales or use tax remittance of 50 percent, 75 percent, or 100 percent of the sales or use tax paid on qualified machinery and equipment, and installment labor and services (RCW 82.08.962; RCW 82.12.962).

The economic impact analysis presented in the 2022 ASC states that the Project would attempt to meet RCW 82.08.962 criteria for a 100 percent remittance of sales tax paid on qualified machinery, equipment, and installment labor and services. These criteria include certification by the Washington State Department of Labor and Industries that the Project was developed under a community workforce agreement or project labor agreement (Horse Heaven Wind Farm, LLC 2022).

While a considerable portion of construction-related materials and labor services would be exempt from Washington State sales and use tax, the following describes the types of construction expenditures that would not be shielded from duties under RCW 82.08.962:

- Local purchases of concrete, rebar, and other raw construction materials
- Expenditures related to O&M building construction
- Local expenditures by construction workers

The following presents the sales tax estimates for the Project's example phased construction:

- Phase 1 construction would generate one-time revenues of approximately $2.9 million in state and $1.0 million in local sales tax (Horse Heaven Wind Farm, LLC 2022).
- Phase 2 (i.e., Phase 2a and 2b) construction would generate one-time revenues of $2.2 million to $3.7 million in state sales tax, and $0.7 million to $1.2 million in local sales tax. Phase 2a represents the lower of the range of both estimates (Horse Heaven Wind Farm, LLC 2022).

Employment, Labor Income, and Economic Output

Table 4.16-1A in **Appendix 4.16-1** shows the distribution of average on-site workforce per month by type of employment for each task. **Table 4.16-1B** in **Appendix 4.16-1** presents estimated construction impacts for Phases 1, 2a, and 2b. The Project's direct impacts on on-site employment as estimated by IMPLAN are summarized below (Horse Heaven Wind Farm, LLC 2022):

- **Phase 1**: Construction of the Project is estimated to create approximately 171 on-site FTE jobs filled by local workers.
- **Phase 2a**: Construction of Phase 2a is estimated to create approximately 152 on-site FTE jobs filled by local workers.
- **Phase 2b**: Construction of Phase 2b is estimated to create 136 on-site FTE construction jobs filled by local workers.

In addition to providing on-site jobs, the Project's construction stage would also support employment, labor income, and economic output in other sectors of the local economy. The IMPLAN estimates for indirect job creation are summarized as follows:

- **Phase 1**: Construction of the Project is estimated to indirectly create 168 jobs.
- **Phase 2a**: Construction of the Project is estimated to indirectly create 199 jobs.

- **Phase 2b**: Construction of the Project is estimated to indirectly create 269 jobs.

The higher number of indirect jobs for Phase 2b is mainly due to local expenditures on construction materials and transmission line-related expenditures, both of which are estimated to be higher for Phase 2b than for Phase 2a (Horse Heaven Wind Farm, LLC 2022). As new income originating from the Project is spent throughout the local economy, the increased economic activity would support induced job creation in unrelated sectors. The IMPLAN estimates for induced job creation are summarized as follows:

- **Phase 1**: Construction of the Project is estimated to support an additional 118 jobs.
- **Phase 2a**: Construction of the Project is estimated to support a further 120 jobs.
- **Phase 2b**: Construction of the Project is estimated to support an additional 135 jobs.

The IMPLAN estimated total jobs and income from the Project are summarized as follows:

- **Phase 1**: Overall, construction of Phase 1 is estimated to support a total of approximately 458 jobs in Benton and Franklin Counties and approximately $37.0 million in labor income, with total economic output of approximately $70.6 million.
- **Phase 2**: Overall, construction of Phase 2 is estimated to support a total of 472 to 539 jobs in Benton and Franklin Counties and approximately $37.6 million to $41.9 million in labor income, with total economic output of approximately $73.0 million to $85.7 million (Horse Heaven Wind Farm, LLC 2022).

As indicated in **Table 4.16-1B** in **Appendix 4.16-1**, construction of the Project would generate economic benefits in the regional economy through direct expenditures for materials and services, as well as new payroll income and both indirect and induced economic benefits. In summary, the Proposed Action would generate local jobs and tax revenue. As a result of these benefits, the Project is not anticipated to have adverse impacts on the study area's economic conditions.

Housing

As indicated in Tables 3.16-5 and 3.16-6 in Section 3.16, vacant housing exists throughout the study area, and the study area maintains substantial short term rental options that include hotels, motels, campgrounds, and recreational vehicle parks. Based on the Applicant's acknowledgment that most construction workers would be sourced locally, and on the availability of short term and long-term rentals throughout the study area, the example Action's construction stage (i.e., Phase 1, Phase 2a, and Phase 2b) would result in a negligible, temporary to short term, feasible, regional impact on housing availability. Adverse impacts would occur if a reduction in short term and long-term rentals reduces supply enough that it causes an increase in rental prices.

Analysis of Project impacts on housing during construction, and impact ratings for this topic, are informed by consideration of all construction activities combined.

Environmental Justice

Table 4.16-3 presents an analysis and ranking of construction impacts on economic conditions and housing availability for the people of color and low-income communities identified in Section 3.16.

Table 4.16-3: Impact of Project Construction on People of Color and Low-Income Communities

Geographic Area	Demographics	Impact on Economic Conditions	Impact on Housing Availability
Franklin County	People of color population of 59% (54% Hispanic alone) (higher than reference threshold: 29%). Low-income population of 34% (higher than reference threshold for low-income: 26%).	Within Franklin County, it is anticipated that the Project would increase economic input, labor income, and tax revenue, which would result in no adverse impact on economic conditions.	With a vacancy rate of 2.7%, 217 units available for rent, and the majority of workers being sourced locally, the construction stage would have a low, short term, feasible, regional impact on housing availability in Franklin County.
Yakima County	People of color population of 57% (51% Hispanic alone) (higher than reference threshold: 29%). Low-income population of 43% (higher than reference threshold for low-income: 26%).	Data not available[(a)]	With a vacancy rate of 2.8%, 793 units available for rent, and the majority of workers being sourced locally, the construction stage would have a low, short-term, feasible, regional impact on housing availability in Yakima County.
Walla Walla County	Low-income population of 31% (higher than reference threshold for low-income: 26%).	Data not available[(a)]	With a vacancy rate of 6.1%, 466 units available for rent, and the majority of workers being sourced locally, the construction stage would have a low, short-term, feasible, regional impact on housing availability in Walla Walla County.
Census Tract 116, Block Group 1, (Lease Boundary)	People of color population of 45% (44% Hispanic alone) (higher than reference threshold: 29%).	Within Benton County, it is anticipated that the Project would increase economic input, labor income, and tax revenue, which would result in no adverse impact on economic conditions.	Based on Benton County's vacancy rate of 5.1%, 1,660 units available for rent, and the majority of the workers being sourced locally, the construction stage would have a low, short-term, feasible, regional impact on housing availability in Census Tract 116, Block Group 1.

Table 4.16-3: Impact of Project Construction on People of Color and Low-Income Communities

Geographic Area	Demographics	Impact on Economic Conditions	Impact on Housing Availability
Census Tract 115.01, Block Group 1, (Lease Boundary)	Low-income population of 41% (higher than reference threshold: 26%).	Within Benton County, it is anticipated that the Project would increase economic input, labor income, and tax revenue, which would result in no adverse impact on economic conditions.	Based on Benton County's vacancy rate of 5.1%, 1,660 units available for rent, and the majority of the workers being sourced locally, the construction stage would have a low, short-term, feasible, regional impact on housing availability in Census Tract 115.01, Block Group 1.
Census Tract 118.01, Block Group 3 (Lease Boundary)	Low-income population of 31% (higher than reference threshold: 26%).	Within Benton County, it is anticipated that the Project would increase economic input, labor income, and tax revenue, which would result in no adverse impact on economic conditions.	Based on Benton County's vacancy rate of 5.1%, 1,660 units available for rent, and the majority of the workers being sourced locally, the construction stage would have a low, short-term, feasible, regional impact on housing availability in Census Tract 118.01, Block Group 3.

Source: Section 3.16 of this EIS

Notes:

[a] The Applicant's IMPLAN analysis focused on Benton and Franklin Counties; Yakima and Walla Walla Counties were not included in the economic impact analysis.

This analysis of construction impacts is informed by consideration of all construction activities combined and incorporates the impact ranking from Section 4.3, Air Quality; 4.10, Visual Aspects, Light and Glare; Section 4.11, Noise and Vibration; Section 4.12, Recreation; and Section 4.14, Transportation. The analysis of air quality, noise, increased transit times, and availability of affordable housing indicates that the Project would adversely impact all people that intersect the Lease Boundary and study area including people of color and low-income communities. The following are examples of adverse impacts identified in the evaluation of air quality, visual aesthetics and recreation, noise and vibration, and transportation that could also impact communities located near the Project by introducing changes to the environmental settings such as traffic, noise levels, air quality, visual quality, and quality of use at recreational sites:

- Increased truck traffic on rural roadways may noticeably increase fugitive dust in identified people of color and low-income communities that intersect the Lease Boundary (Section 4.3, Air Quality).
- Construction and the erection of turbines could obstruct views from residences or views of or from recreation resources (4.10 Visual Aspects, Light and Glare; Section 4.12, Recreation).
- Construction noise impacts within the Project Lease Boundary could be loud enough at times to temporarily interfere with speech communication outdoors and indoors with windows open (Section 4.11).

- During Project construction, many construction vehicles, including trucks with oversized and overweight loads, would need to share the existing roadway network with the general public (Section 4.15).

Block Group Level Analysis

The Applicant intends to use a portable concrete batch plant (CBP) during each phase of construction for a period of up to four months. A portable CBP would be installed near the east laydown area during Phase 1 construction and a portable CBP would be installed near the west laydown area during Phase 2 construction. The CBPs are anticipated to operate for a period of about 4 months at each location. Additionally, the Applicant intends to locate standby generators at or near their east and west laydown yards (Tetra Tech 2023). The following describes an analysis of how potential use of CBPs and standby generators would impact the census tract block groups that intersect the Lease Boundary

- As shown in Figures 3.16-1 and 3.16-2, the west laydown area occurs within Census Tract 116, Block Group 1 and the east laydown area occurs within Census Tract 118.01 Block Group 3. As presented in Table 3.16-3, Census Tract 116, Block Group 1 has a higher percentage of people of color than the reference threshold percentage, while the percentage of people of color within Census Tract 118.01 Block Group 3 is below the threshold percentage. As presented in Table 3.16-6, Census Tract 118.01 Group 3 has a higher percentage of low-income population than the reference threshold community, Census Tract 116, Block Group 1 does not.
- As discussed in Section 4.3, air quality impacts are small when compared to the regional emission inventory and the modeling performed shows no indication that any ambient air quality standard would be violated because of construction. Based on the supplemental emissions calculations, air quality dispersion modeling, proposed localities of the CBPs and standby generators, the Project is unlikely to disproportionately impact the air quality of census tract block groups with a higher percentage of people of color or low-income populations than the reference thresholds.

The Applicant intends to use Interstate-82 to mobilize equipment and materials from collection points in Oregon and beyond to Laydown Areas 1 and 2. Additionally, the Applicant has committed to promoting car pools for employees that relocate to the study area for the Project's construction phase. It is anticipated that local employees would use their personal vehicles and transit to and from the job site. These Applicant Commitments presented in Section 4.14 would minimize the use of rural collector roads by heavy transports limiting impacts on people of color and low-income populations within the Lease Boundary.

The magnitude of impacts from construction of the Project is anticipated to be negligible for light, low for glare, medium for visual aspects (Sections 4.10), negligible to low for air quality (Section 4.3), low to medium for noise (Section 4.11), medium for recreational sites (Section 4.12) and low for transportation (Section 4.14). Impacts from the combined construction of the Project on people of color and low-income communities would be negligible to medium in magnitude, short term due to the potential for impacts to occur during the entire construction stage, feasible, and confined to regional in spatial extent.

The Proposed Action is not anticipated to disproportionately impact people of color or low-income communities because:

- The Lease Boundary and study area span multiple communities, the majority of which are not communities of low-income or people of color;

- The communities within the Lease Boundary and near the Lease Boundary have a combined low-income population and a combined people of color population that are very similar to those of the reference community (Benton County).
- The communities (e.g., census block groups) that were identified as communities of low income or people of color, have low populations and dispersed urban development within large census areas. Additionally, these areas tend to be farther away from the Project than comparative communities.
- The communities that were identified as communities of low-income or people of color and the communities that fell below the low-income and people of color thresholds will experience similar levels of risk of impacts from other environmental stressors (i.e., proximity to traffic, superfund sites, hazardous waste facilities).

4.16.2.2 Impacts during Operation

Once the construction stage is complete, the Project's operations stage would continue to contribute to the local economy. The Project would provide direct operation-related employment and expenditures. A team of 16 to 20 personnel would be employed to operate and maintain Project components. Operations staff would include a facility manager, a Project site manager, a Project site lead, and a certified crew of technicians (Horse Heaven Wind Farm, LLC 2022). Activities and expenditures during the operations stage are summarized below:

- The Project would require preventive and corrective maintenance of the turbines, solar arrays, BESS, electrical collection system, and substations.
- Routine inspections would be conducted to ensure continuing plant and transmission system safety and reliability.
- Vehicle-related expenditures would include fuel costs, site maintenance, replacement parts and equipment, and miscellaneous supplies (Horse Heaven Wind Farm, LLC 2022).

Lease payments to landowners would also generate annual benefits to the local economy over the expected 35-year operating life of the Project.

Population

Employment and Labor Income

Table 4.16-1C in **Appendix 4.16-1** presents estimated operations impacts for example construction Phases 1, 2a, and 2b. Annual average impacts are based on estimated operations and maintenance expenditures for a 35-year period of operation. The following summarizes the direct impacts of the Project's operations on on-site employment as estimated by IMPLAN:

- **Phase 1**: Eleven FTEs would be employed on site to operate and maintain the Phase 1 portion of the Project.
- **Phase 2 (i.e., Phase 2a and 2b)**: Nine FTEs would be employed on site to operate and maintain the facility.

On-site workers would be hired from the local population in Benton and Franklin Counties or within the larger study area. Operation and maintenance of the Project would also support employment, labor income, and economic output in other sectors of the local economy (Horse Heaven Wind Farm, LLC 2022). In addition to providing on-site jobs, operation of the Project would also support employment, labor income, and economic output in other sectors of the local economy. The IMPLAN estimates for indirect job creation are summarized as follows:

- **Phase 1**: Approximately 12 jobs would be indirectly created by operation and maintenance of the Project.
- **Phase 2:** Approximately 9 to 10 jobs would be indirectly created by operation and maintenance of the Project.

The following details the IMPLAN estimates for induced job creation by Project phase:

- **Phase 1**: Operation and maintenance of the Project is estimated to support an additional nine jobs.
- **Phase 2**: Operation and maintenance of the Project is estimated to support an additional seven jobs. (Horse Heaven Wind Farm, LLC 2022).

Economic Conditions

Fiscal Impact

The fiscal impact analysis prepared as part of the 2022 ASC estimated local tax revenues that would be expected to accrue as a result of the Project's construction.

Property Tax

The parcels that make up the Lease Boundary fall within several different Tax Areas. The 2022 ASC states that in 2020, the most common rate (i.e., millage (mill) or levy) identified for the parcels that make up the Lease Boundary was 11.49 mills. The average tax rate for the parcels within the Lease Boundary is very similar to the Tax Area and county averages. The property tax estimates presented in the 2022 ASC used the 2020 Benton County average rate of 11.40 mills to estimate potential property tax revenues based on the estimated installed cost of the Project by phase. Estimated Project-related property tax revenues are assumed to be "add-ons" to existing levy amounts and would represent increases above current levels.

Property tax revenues are estimated for each phase for the first year of operation. Total property tax revenues are also estimated for the assumed 35-year operating life of the Project. The assessed values of the Project phases over this period are estimated based on the installed cost, average mill rate, and Washington Department of Revenue 2021 Personal and Industrial Property Valuation Guidelines (Horse Heaven Wind Farm, LLC 2022). The estimated property taxes that the Applicant would owe during operations are summarized as follows:

- **Phase 1**: Phase 1 would generate an estimated $10.4 million in property taxes in its first year of operation. This estimated total is equivalent to approximately 4.1 percent of the total property tax revenues generated in Benton County in 2020 (Horse Heaven Wind Farm, LLC 2022).
  - Over the 35-year operating life of the Project, Phase 1 would generate an estimated $140.6 million in total property tax revenues.
  - Viewed in dollar terms, Phase 1 during its first year of operation would generate approximately $6.1 million in school-related tax revenues, with $3.4 million of this total paid directly to local school districts.
  - The next largest share of property tax revenues would go to fire districts (14 percent), followed by roads (12 percent).

- **Phase 2**: Phase 2 would generate an estimated $9.0 million in property taxes in its first year of operation. This estimated total, which is the same for both Phases 2a and 2b, is equivalent to approximately 3.5 percent of the total property tax revenues generated in Benton County in 2020 (Horse Heaven Wind Farm, LLC 2022). The property tax revenues paid by the Applicant under the Phase 2 scenario may be summarized as follows:
  - Over the 35-year operating life of the Project, Phase 2a would generate an estimated $122.3 million in total property tax revenues.
  - The estimated total generated under Phase 2b over the same 35-year period would be $121.7 million.
  - Viewed in dollars terms, Phase 2 combined would generate approximately $5.3 million in school-related tax revenues, $2.9 million of which would be paid directly to local school districts (Horse Heaven Wind Farm, LLC 2022).

Under RCW 84.34, land classified as farm and agricultural land can receive tax relief from property taxes. Under Phase 2a, construction of the solar component of the Project would result in additional property tax revenue for Benton County as the land would be taken out of production. This potential source of revenue would only occur under Phase 2a because Phase 2b does not include solar facilities (Horse Heaven Wind Farm, LLC 2022).

Economic Output

Estimated indirect and induced impact estimates include the impacts of Project-related lease payments to participating landowners, including the Washington Department of Natural Resources.

The IMPLAN estimated total jobs and income are summarized below:

- **Phase 1**: Overall, operation of Phase 1 is estimated to support approximately 32 total (direct, indirect, and induced) jobs in Benton and Franklin Counties and approximately $2.4 million in labor income, with total economic output of approximately $5.5 million. These estimated annual impacts are expected to occur each year that the Project operates.
- **Phase 2**: Overall, operation of Phase 2 (if both Phase 2a and 2b are constructed) is estimated to support approximately 24 to 26 total (direct, indirect, and induced) jobs in Benton and Franklin Counties and approximately $1.8 million to $2.1 million in labor income, with total economic output of approximately $4.1 million to $5.2 million (Horse Heaven Wind Farm, LLC 2022).

Housing

As indicated in **Table 4.16-1C** in **Appendix 4.16-1**, the Proposed Action would generate or support up to 58 FTEs. Based on the availability of housing within the study area (see Table 3.16-7 in Section 3), the Project's operations stage is anticipated to result in a negligible, long-term, feasible, regional impact on housing availability. An adverse impact on housing availability would occur only if workers have to relocate to the study area.

Analysis of Project impacts on housing during operation, and impact ratings for this topic, are informed by all phases of Project operations combined.

Environmental Justice

The analysis of impacts that the Project's operations stage (i.e., Phase 1, 2a, and 2b combined) would have on people of color and low-income communities incorporates the impact rankings from Section 4.3, Air Quality; Section 4.11, Noise and Vibration; and Section 4.14, Transportation.

Based on the IMPLAN model (**Appendix 4.16-1**), it is anticipated that by increasing property tax revenue and payroll income locally, the Project would not result in adverse economic impacts on people of color and low-income communities. For example, Project-generated property tax revenues would go directly to the school districts and fire stations that service communities that intersect with the Lease Boundary.

As indicated in Sections 4.3, Air Quality; 4.10, Visual Aspects, Light and Glare; 4.11, Noise and Vibration; 4.12, Recreation; and 4.14, Transportation, the Project would adversely impact the communities that intersect the Lease Boundary and study area including people of color and low-income communities. Examples of adverse impacts on these communities that are anticipated to result from the Project's operations stage include the following:

- Driving on gravel roads to service Project components would generate fugitive dust (Section 4.3, Air Quality).
- Turbines could obstruct views from residences or views of or from recreation resources (Section 4.10, Visual Aspects, Light and Glare; Section 4.12, Recreation).
- Noise levels at the closest residences would be at or near the WAC nighttime noise limit of 50 A-weighted decibels (Section 4.11, Noise and Vibration).
- The Project would add 16 to 20 vehicle trips per day to the O&M facilities, with an additional 35 trips per day during periods of panel washing (Section 4.14, Transportation).

While impacts from operation of the Project are anticipated to be negligible on air quality (Section 4.3), low on transportation (Section 4.14), and medium on noise and recreational sites (Sections 4.11 and 4.12), impacts are anticipated to be medium to high on visual aspects during operation of the Project (Section 4.10).

Impacts from operation of the Project on all people that intersect the Lease Boundary and study area, including people of color and low-income individuals in these communities, would be negligible to medium in magnitude, long term due to the potential for impacts to occur during the entire operations stage, feasible, and confined in spatial extent.

Operation of the Project is not anticipated to disproportionately impact people of color or low-income communities because:

- The Project Lease Boundary and study area span multiple communities, the majority of which were not identified as low-income populations or communities of color.
- The census block groups that were identified as low-income populations or communities of color, have low populations and dispersed urban development within large-size census areas, mainly in areas farther away from the Project.
- The communities within the Lease Boundary and near the Lease Boundary have a combined low-income population and a combined people of color population that are very similar to those of the reference community (Benton County).
- The communities that were identified as communities of low income or people of color are not at greater risk of impacts from other environmental stressors (i.e., proximity to traffic, superfund sites, hazardous waste, and facilities).

- The majority of the identified viewpoints (selected residences or recreation sites) that are anticipated to experience high impacts relating to visual aspects, during the operation of the Project, are located within areas where the identified communities of low income or people of color are proportionally below the reference community.

4.16.2.3 Impacts during Decommissioning

Impacts on housing availability for residents within the study area during the decommissioning stage would be similar to those described for the Project's construction stage. The analysis of Project-related impacts on housing during decommissioning, and impact ratings for this topic, are informed by consideration of combined decommissioning activities. Based on the Applicant's acknowledgment that the majority of workers would be sourced locally, and on the availability of short-term and long-term rentals throughout the study area, the decommissioning stage is anticipated to result in a negligible, temporary to short term, feasible, regional impact on housing availability. Adverse impacts would occur if a reduction in short-term and long-term rentals were to reduce supply to the point that it caused an increase in rental prices.

Decommissioning of the Project would generate economic benefits in the regional economy through direct expenditures for materials and services, as well as new payroll income. However, it is anticipated that Project decommissioning would impact tax revenues and, as a result, general wellbeing. Therefore, in addition to impacts on housing and people of color and low-income populations (the two topics analyzed for construction and operation stages of the Project), analysis of decommissioning-related impacts includes analysis impacts on wellbeing.

Decommissioning of the Project would result in property tax revenues for Benton County and the Tax Area returning to levels typical of the area prior to the Project as the Project's added value would be removed from the parcels that make up the Lease Boundary's valuation. For example, a reduction to smaller pre-Project collections would impact operational budgets for schools, school districts, and fire stations within Benton County and the Tax Area. The discontinuation of increased tax revenues as a result of the decommissioning of the Project is not considered as an adverse impact for the purposes of this EIS as there is not anticipated to be net reduction of tax revenues when comparing pre-Project and post-Project conditions.

Environmental Justice

Similar to the impacts described for construction, the analysis of air quality, visual aspects, noise, increased transit times, and availability of affordable housing indicates that Project decommissioning would adversely impact people of color and low-income communities that intersect the Lease Boundary.

Impacts from the combined decommissioning of the Project on all people that intersect the Lease Boundary and study area, including people of color and low-income communities would be negligible to medium in magnitude, temporary to short term due to the potential for impacts to occur during the entire decommissioning stage, feasible and local in spatial extent. For instance, decommissioning would result increases in traffic and noise within and near the Lease Boundary.

Decommissioning would not be anticipated to disproportionately impact potential people of color or low-income communities, because:

- The Lease Boundary and study area span multiple communities, the majority of which are not communities of low-income or people of color.

- The communities within the Lease Boundary and near the Lease Boundary have a combined low-income population and a combined people of color population that are very similar to those of the reference community (Benton County).
- The communities (e.g., census block groups) that were identified as communities of low income or people of color have low populations and dispersed urban development within large census areas. Additionally, these areas tend to be farther away from the Project than comparative communities.
- The communities that were identified as communities of low-income or people of color are not in greater risk of impacts from other environmental stressors (i.e., proximity to traffic, superfund sites, hazardous waste facilities).

4.16.2.4 Recommended Mitigation Measures

In addition to mitigation measures detailed in Sections 4.3, Air Quality; 4.11, Noise; and 4.14, Transportation, the Washington Energy Facility Site Evaluation Council has identified the following additional and modified mitigation measure for the Project to avoid and/or minimize potential impacts on socioeconomics:

Socio-ec-1:[69] Prior to decommissioning, the Applicant would provide an up-to-date analysis on the availability of temporary housing for workers. If sufficient temporary housing for workers is not available, the Applicant would present EFSEC with options for housing workers from outside the community.

Rationale: This mitigation measure would minimize adverse impacts on the availability of housing for residents of the surrounding communities.

4.16.2.5 Post-Adjudication Applicant Commitments

The Draft EIS for the Project was released in December 2022 and included the Applicant's proposed commitments to minimize or avoid impacts of the Project on each analyzed element of the environment. The effectiveness of the Applicant's proposed commitments in reducing impacts was analyzed for each resource in the subsections of Chapter 4. Within the Draft EIS, EFSEC recommended additional mitigation measures beyond the Applicant's proposed commitments to minimize impacts. Both the Applicant commitments and the EFSEC-recommended mitigation measures were considered when characterizing the residual impacts (those remaining after application of mitigation) to determine whether a significant, unavoidable, adverse impact would result.

Comments on the Draft EIS were received from the public, Applicant, Tribes and agencies related to the recommended mitigation during the public commenting period. Prior to the issuance of this Final EIS, mitigation measures were further developed and refined by technical working groups convened to review and respond to public comments and concerns.

As requested by EFSEC in Data Request 9, the Applicant provided a memorandum summarizing the changes that the Applicant was making to the Project in response to comments received on the Draft EIS, input from regulatory agencies, changes to applicable regulations, testimony from the adjudicative hearings, and information received from the Bonneville Power Administration (BPA). Additional Applicant commitments were identified and finalized in the Applicant's Final ASC, as per WAC 463-60-116 (Horse Heaven Wind Farm, LLC 2023). This regulation requires applicants to submit "application amendments which include all commitments and stipulations

[69] Socio-ec-: Identifier of numbered mitigation item for Socioeconomics

made by the applicant during the adjudicative hearings." A more detailed discussion of the proposed changes is provided in Chapter 2.

A summary of the additional Applicant commitments and other changes provided in the Final ASC is provided below:

- Reduce East Solar Array size
- Shift turbine infrastructure (Turbine Option 1) away from Webber and Sheep Canyons
- Remove four wind turbines (Turbine Option 1) near Benton City
- Remove Turbine 116 (Turbine Option 1)
- Remove Turbines 119, 121,122, 123, 124, 125, 162, and 243 (Turbine Option 1)
- Remove Turbines 5, 6, and 7 (Turbine Option 2)
- Remove duplicate transmission line and substation infrastructure and consider undergrounding of transmission lines where applicable
- Add/modify construction laydown areas, including the addition of one laydown yard outside of the Project Lease Boundary[70]
- Add radar towers associated with aircraft detection lighting system (ADLS), including one tower outside of the Project Lease Boundary
- Modify transmission line route to BPA Webber Canyon Substation, including the addition of 1,130 feet of transmission line extending outside the Project Lease Boundary
- Update fire protection systems information
- Increase the size of the West BESS in concert with the reduction of the East and Southwest BESS
- Potential Use of DNR Gould Well, outside of the Project Lease Boundary, for Water Supply

Considering the post-adjudication Applicant commitments and other changes provided in the Final ASC, the overall impact remains substantially similar due to the turbines and other Project infrastructure that remain. The additional Applicant commitments identified above do not change the impact ratings previously provided for socioeconomics in the Draft EIS, and the impact ratings remain the same.

4.16.2.6 Significant Unavoidable Adverse Impacts

Determining the significance of an impact involves context and intensity, which, in turn, depend on the magnitude and duration of an impact. "Significant" in the Washington State Environmental Policy Act means a reasonable likelihood of more than a moderate adverse impact on environmental quality. An impact may also be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred (WAC 197-11-794).

[70] The addition of new disturbance and/or infrastructure outside of the Project Lease Boundary will require supplemental analysis.

This EIS weighs the potential impacts on socioeconomics that may result from the Proposed Action with mitigation and makes a resulting determination of significance for each impact in **Tables 4.16-4a, 4.16-4b, and 4.16-4c**. As shown in the summary impact tables for socioeconomics, EFSEC has determined that no significant unavoidable adverse impacts would occur to the study area's social and economic conditions and people of color and low income populations.

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Table 4.16-4a: Summary of Potential Impacts on Socioeconomics during Construction of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Economic Environment (Housing Availability)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Phase 1 is anticipated to directly support an average monthly workforce of 300, and Phases 2a and 2b are anticipated to support an average monthly force of 267 and 271, respectively. The majority of construction workers would be sourced locally; however, the Project's construction would require the temporary and short-term relocation of non-local construction workers into the region. As reported in the 2019 American Community Survey 5-Year Estimate, rental vacancy rate in Benton County was 5.1%, with 1,660 units available for rent.	Negligible	Temporary to Short Term	Feasible	Regional	No mitigation identified	None identified
Environmental Justice (People of Color and Low-Income Populations)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Disproportionate impacts on people of color and low-income communities.	Negligible to Medium	Short Term	Feasible	Confined to Regional	No mitigation identified	None identified

Notes:
Source: American Community Survey (2019) 5-Year Estimate Data (U.S. Census Bureau 2020)
Source: Horse Heaven Windfarm, LLC 2022
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

Table 4.16-4b: Summary of Potential Impacts on Socioeconomics during Operation of the Proposed Action

Topic	Component[(a)]	Description of Impact[(b)]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[(c)]	Significant Unavoidable Adverse Impacts[(d)]
Economic Environment (Housing Availability)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The Proposed Action would generate or support up to 58 FTEs. A team of 16 to 20 personnel would be employed to operate and maintain Project components. As reported in the 2019 American Community Survey 5-Year Estimate, rental vacancy rate in Benton County was 5.1%, with 1,660 units available for rent.	Negligible	Long Term	Feasible	Regional	No mitigation identified	None identified
Environmental Justice (People of Color and Low-Income Populations)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Disproportionate impacts on people of color and low-income communities.	Negligible to Medium	Long Term	Feasible	Confined	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including “comprehensive Project,” were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council; FTE = full-time equivalent

Table 4.16-4c: Summary of Potential Impacts on Socioeconomics during Decommissioning of the Proposed Action

Topic	Component[a]	Description of Impact[b]	Magnitude of Impact: ▪ Negligible ▪ Low ▪ Medium ▪ High	Duration of Impact: ▪ Temporary ▪ Short Term ▪ Long Term ▪ Constant	Likelihood of Impact: ▪ Unlikely ▪ Feasible ▪ Probable ▪ Unavoidable	Spatial Extent or Setting of Impact: ▪ Limited ▪ Confined ▪ Local ▪ Regional	Mitigation[c]	Significant Unavoidable Adverse Impacts[d]
Economic Environment (Housing Availability)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	The majority of construction workers would be sourced locally; however, the Project's construction would require temporary and short-term relocation of construction workers into the region.	Negligible	Temporary to Short Term	Feasible	Regional	**Socio-ec-1:** Updated housing analysis to confirm temporary or short-term availability	None identified
General Welfare and Social Conditions (Wellbeing)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Decommissioning of the Project would restore property tax revenues for Benton County and the Tax Area to pre-Project conditions as the Project's added value would be removed from the parcels that make up the Lease Boundary's valuation. For example, smaller collections would impact operational budgets for schools, school districts, and fire stations within Benton County and the Tax Area.	Medium	Short Term	Feasible	Regional	No mitigation identified	None identified
Environmental Justice (People of color and Low-Income Populations)	Turbine Option 1 Turbine Option 2 Solar Arrays BESS Substations **Comprehensive Project**	Disproportionate impacts on people of color and low-income communities.	Negligible to Medium	Temporary to Short Term	Feasible	Regional	No mitigation identified	None identified

Notes:
(a) The impacts related to each component, including "comprehensive Project," were rated separately; components were combined in the same cell if they received the same impact ratings for the identified topic.
(b) Design features, best management practices, and other actions proposed by the Applicant to avoid or minimize environmental impacts were assumed to be part of the Proposed Action and were taken into account when identifying the impacts.
(c) Mitigation measures listed here are additional actions that EFSEC could impose to further reduce the impacts. See Section 4.1 Introduction for details.
(d) Significant unavoidable impacts are those that would remain even after all identified additional mitigation measures have been required by EFSEC.
BESS = battery energy storage system; EFSEC = Washington Energy Facility Site Evaluation Council

4.16.3 Impacts of No Action Alternative

Under the No Action Alternative, impacts related to socioeconomics from the construction, operation, and decommissioning of the Proposed Action would not occur. For the purpose of this analysis, it is assumed that no future development would occur within the Lease Boundary.

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APPENDIX 4.3-1

Emission Calculations

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Horse Heaven Wind Farm LLC's Emission Calculations

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Horse Heaven Wind Farm - Construction Emissions
Emission Summary by Phase and Calendar Year

Emission Totals by Phase	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Phase 1 Wind	3.03	24.66	17.83	1.34	1.29	0.03	0.40	9,093.78	0.29	0.17	9,150.72
Phase 1 Solar	2.12	14.67	9.94	1.15	1.11	0.02	0.39	4,794.30	0.16	0.10	4,827.91
Phase 1 Battery	0.27	2.29	1.42	0.12	0.11	2.51E-03	0.03	806.49	0.03	1.37E-02	811.34
Phase 1 total	**5.43**	**41.63**	**29.19**	**2.61**	**2.51**	**0.05**	**0.82**	**14,694.57**	**0.48**	**0.28**	**14,789.97**
Phase 2a Wind	3.47	29.48	18.44	1.68	1.62	0.04	0.53	11,198.93	0.33	0.22	11,272.03
Phase 2a Solar	1.92	13.23	8.75	1.05	1.01	1.43E-02	0.36	4,547.13	0.15	0.10	4,579.36
Phase 2a Battery	0.25	2.12	1.27	0.11	0.11	2.47E-03	0.03	797.29	0.03	1.37E-02	802.14
Phase 2a total	**5.64**	**44.82**	**28.46**	**2.84**	**2.73**	**0.05**	**0.92**	**16,543.35**	**0.51**	**0.33**	**16,653.53**
Phase 2b Wind	4.27	36.73	22.69	2.04	1.96	0.04	0.64	13,857.79	0.41	0.27	13,947.13
Phase 2b total	**4.27**	**36.73**	**22.69**	**2.04**	**1.96**	**0.04**	**0.64**	**13,857.79**	**0.41**	**0.27**	**13,947.13**
O&M	0.07	0.28	0.62	9.43E-03	8.65E-03	5.46E-04	0	134.31	1.22E-02	1.00E-03	134.91
O&M total	**0.07**	**0.28**	**0.62**	**9.43E-03**	**8.65E-03**	**5.46E-04**	**0**	**134.31**	**1.22E-02**	**1.00E-03**	**134.91**

Emission Totals by Calendar Year	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
2023 (Phase 1)	5.43	41.63	29.19	2.61	2.51	0.05	0.82	14,694.57	0.48	0.28	14,789.97
2024 (Maximum of Phase 2a or 2b)	5.64	44.82	28.46	2.84	2.73	0.05	0.92	16,543.35	0.51	0.33	16,653.53
2025 and onward (O&M)	0.07	0.28	0.62	9.43E-03	8.65E-03	5.46E-04	0	134.31	1.22E-02	1.00E-03	134.91

Horse Heaven Wind Farm - Construction Emissions
Summary of Construction Schedule by Phase

Proposed Phase 1 Construction Schedule

Task	Start	Finish
Road Construction	1/13/2023	5/3/2023
Wind Turbine Foundations	1/27/2023	4/26/2023
Wind Turbine Assembly	5/4/2023	8/21/2023
Wind Plant Commissioning	7/31/2023	10/30/2023
Solar Array Construction	1/1/2023	10/31/2023
Electrical System Installation	2/15/2023	9/1/2023
Battery Energy Storage System	5/4/2023	9/1/2023
Solar Plant Commissioning	9/1/2023	11/30/2023
Electrical System and Substation	2/15/2023	7/28/2023
O&M Building	3/17/2023	6/28/2023
Phase 1 Final Commercial Operation Date	**11/30/2023**	**-**

Proposed Phase 2a Construction Schedule

Task	Start	Finish
Road Construction	1/13/2024	5/3/2024
Wind Turbine Foundations	1/27/2024	4/26/2024
Wind Turbine Assembly	5/4/2024	8/21/2024
Wind Plant Commissioning	7/31/2024	10/30/2024
Solar Array Construction	1/1/2024	10/31/2024
Electrical System Installation	2/15/2024	9/1/2024
Battery Energy Storage System	5/4/2024	9/1/2024
Solar Plant Commissioning	9/1/2024	11/30/2024
Electrical System and Substation	2/15/2024	7/28/2024
O&M Facilities	3/17/2024	6/28/2024
Transmission Line Construction	1/1/2024	8/1/2024
Phase 2a Final Commercial Operation Date	**11/30/2024**	**-**

Proposed Phase 2b Construction Schedule

Task	Start	Finish
Road Construction	1/13/2024	5/3/2024
Wind Turbine Foundations	1/27/2024	4/26/2024
Electrical System and Substation	2/15/2024	7/28/2024
Wind Turbine Assembly	5/4/2024	8/21/2024
O&M Facilities	3/17/2024	6/28/2024
Transmission Line Construction	1/1/2024	8/1/2024
Plant Commissioning	7/31/2024	10/30/2024
Phase 2b Final Commercial Operation Date	**10/30/2024**	**-**

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC application for site certification.

Horse Heaven Wind Farm - Construction Emissions
Phase 1 Wind (350 MW)

								Fuel Use	Emissions										
Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	gal	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	107	12	59%	24	27,989	0.02	0.21	0.07	0.02	1.47E-02	1.14E-03	4.11E-03	422.26	1.17E-03	1.08E-02	425.49
Excavator / Backhoe	2270002036	150	diesel	108	12	59%	24	20,993	1.05E-02	0.21	0.07	0.02	0.02	8.49E-04	2.53E-03	316.70	8.82E-04	8.06E-03	319.13
Loader / Skid Steer loader	2270002072	150	diesel	116	12	21%	24	8,679	0.22	1.16	0.71	0.13	0.13	4.81E-04	0.05	130.94	1.11E-02	3.33E-03	132.21
Motor grader	2270002048	100	diesel	110	12	59%	24	13,994	1.09E-02	0.18	0.07	0.02	0.02	5.76E-04	2.62E-03	211.12	9.21E-04	5.38E-03	212.75
Vibratory Roller	2270002015	75	diesel	114	12	59%	18	8,741	1.04E-02	0.27	0.10	1.27E-02	1.23E-02	3.61E-04	2.51E-03	131.87	7.68E-04	3.36E-03	132.89
Dump / Belly Truck	-	-	diesel	302	-	-	72	12,804	0.03	0.48	0.20	1.31E-02	1.21E-02	4.87E-04	-	144.10	3.21E-03	3.13E-04	144.27
Water Truck	-	-	diesel	304	-	-	48	4,963	0.02	0.11	0.07	2.48E-03	2.28E-03	1.87E-04	-	55.85	8.11E-03	3.24E-04	56.15
Fuel Truck	-	-	diesel	304	-	-	12	1,241	4.78E-03	0.03	0.02	6.19E-04	5.70E-04	4.68E-05	-	13.96	2.03E-03	8.09E-05	14.04
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	106	12	43%	12	10,089	1.18E-02	0.14	0.03	6.58E-03	6.39E-03	4.19E-04	2.84E-03	152.20	8.21E-04	3.88E-03	153.37
Concrete pump truck	2270002042	200	diesel	105	12	43%	8	6,713	0.07	0.90	0.22	0.04	0.04	3.72E-04	0.02	101.28	3.70E-03	2.58E-03	102.14
Concrete Truck	2270002042	150	diesel	104	12	43%	64	40,268	0.50	5.77	1.49	0.31	0.30	2.23E-03	0.12	607.50	0.03	0.02	612.76
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	16	13,995	6.99E-03	0.14	0.05	1.06E-02	1.02E-02	5.66E-04	1.69E-03	211.13	5.88E-04	5.38E-03	212.75
Forklifts	2270003020	75	diesel	109	12	59%	12	5,828	1.35E-03	0.13	1.19E-02	2.07E-03	2.01E-03	2.32E-04	3.25E-04	87.93	1.02E-04	2.24E-03	88.60
Skid Steer loader	2270002072	150	diesel	116	12	21%	8	2,893	0.07	0.39	0.24	0.04	0.04	1.60E-04	0.02	43.65	3.69E-03	1.11E-03	44.07
Dump Truck	-	-	diesel	302	-	-	24	4,268	9.13E-03	0.16	0.07	4.38E-03	4.03E-03	1.62E-04	-	48.03	1.07E-03	1.04E-04	48.09
Transportation Trucks - materials	-	-	diesel	301	-	-	24	4,080	5.47E-03	0.12	0.06	2.28E-03	2.10E-03	1.54E-04	-	45.92	5.77E-04	5.18E-05	45.95
Water Truck	-	-	diesel	304	-	-	12	1,241	4.78E-03	0.03	0.02	6.19E-04	5.70E-04	4.68E-05	-	13.96	2.03E-03	8.09E-05	14.04
Fuel Truck	-	-	diesel	304	-	-	8	827	3.19E-03	0.02	1.13E-02	4.13E-04	3.80E-04	3.12E-05	-	9.31	1.35E-03	5.39E-05	9.36
Electrical																			
Boom Truck	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Fork Truck for Spool Offload	2270003020	75	diesel	109	12	59%	12	5,828	1.35E-03	0.13	1.19E-02	2.07E-03	2.01E-03	2.32E-04	3.25E-04	87.93	1.02E-04	2.24E-03	88.60
Man Lift Bucket	2270003010	150	diesel	101	12	21%	12	4,353	0.04	0.26	0.13	0.03	0.03	2.02E-04	9.51E-03	65.67	2.17E-03	1.67E-03	66.23
Trencher	2270002030	200	diesel	119	12	59%	12	13,991	0.03	0.34	0.11	0.02	0.02	6.02E-04	7.03E-03	211.07	1.96E-03	5.37E-03	212.72
Excavators / Backhoes	2270002036	150	diesel	108	12	59%	12	10,496	5.24E-03	0.11	0.03	7.92E-03	7.68E-03	4.24E-04	1.27E-03	158.35	4.41E-04	4.03E-03	159.56
Winch Truck	2270002051	250	diesel	111	12	59%	18	26,242	8.04E-03	0.09	0.02	4.14E-03	4.02E-03	1.05E-03	1.94E-03	395.89	3.64E-04	1.01E-02	398.90
Transportation Trucks - materials	-	-	diesel	301	-	-	32	5,440	7.30E-03	0.16	0.08	3.04E-03	2.79E-03	2.05E-04	-	61.22	7.70E-04	6.91E-05	61.26
Substation																			
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	8	6,998	3.50E-03	0.07	0.02	5.28E-03	5.12E-03	2.83E-04	8.45E-04	105.57	2.94E-04	2.69E-03	106.38
Bulldozer	2270002069	200	diesel	107	12	59%	8	9,330	5.69E-03	0.07	0.02	5.06E-03	4.91E-03	3.79E-04	1.37E-03	140.75	3.91E-04	3.58E-03	141.83
Concrete Trucks	2270002042	150	diesel	104	12	43%	16	10,067	0.13	1.44	0.37	0.08	0.07	5.58E-04	0.03	151.87	6.51E-03	3.87E-03	153.19
Drill Rig	2270002033	100	diesel	103	12	43%	8	3,356	0.04	0.47	0.12	0.03	0.03	1.86E-04	9.83E-03	50.63	2.28E-03	1.29E-03	51.07
Man Lift Bucket	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Trencher	2270002030	200	diesel	119	12	59%	8	9,327	0.02	0.23	0.07	1.47E-02	1.43E-02	4.01E-04	4.68E-03	140.71	1.30E-03	3.58E-03	141.81
Winch Truck	2270002051	250	diesel	111	12	59%	4	5,831	1.79E-03	0.02	4.57E-03	9.20E-04	8.93E-04	2.32E-04	4.30E-04	87.98	8.10E-05	2.24E-03	88.65
Cranes	2270002045	200	diesel	106	12	43%	8	6,726	7.87E-03	0.10	0.02	4.39E-03	4.26E-03	2.80E-04	1.89E-03	101.47	5.47E-04	2.58E-03	102.25
Forklifts	2270003020	75	diesel	109	12	59%	8	3,886	8.97E-04	0.09	7.96E-03	1.38E-03	1.34E-03	1.55E-04	2.17E-04	58.62	6.80E-05	1.49E-03	59.07
Skid Steer Loaders	2270002072	150	diesel	116	12	21%	4	1,447	0.04	0.19	0.12	0.02	0.02	8.02E-05	8.91E-03	21.82	1.85E-03	5.56E-04	22.03
Dump Truck (Side or belly dump)	-	-	diesel	302	-	-	16	2,845	6.09E-03	0.11	0.04	2.92E-03	2.68E-03	1.08E-04	-	32.02	7.13E-04	6.96E-05	32.06
Wind Turbine Assembly & Erection																			
Man Lift Bucket	2270003010	150	diesel	101	12	21%	40	14,511	0.13	0.86	0.45	0.09	0.09	6.74E-04	0.03	218.91	7.23E-03	5.57E-03	220.76
Forklift	2270003020	75	diesel	109	12	59%	20	9,714	0.00	0.22	0.02	3.46E-03	3.35E-03	3.87E-04	5.42E-04	146.55	1.70E-04	3.73E-03	147.67
Rough Terrain Cranes	2270002045	200	diesel	106	12	43%	50	42,036	0.05	0.60	0.14	0.03	0.03	1.75E-03	0.01	634.16	3.42E-03	0.02	639.06
Track mounted cranes	2270002045	200	diesel	106	12	43%	12	10,089	0.01	0.14	0.03	6.58E-03	6.39E-03	4.19E-04	2.84E-03	152.20	8.21E-04	3.88E-03	153.37
equip	-	-	diesel	301	-	-	252	42,838	5.75E-02	1.27	0.60	2.39E-02	0.02	1.62E-03	-	482.12	6.06E-03	5.44E-04	482.43
O&M Building																			
Excavators or Backhoes	2270002036	150	diesel	108	10	59%	12	8,747	4.37E-03	0.09	0.03	6.60E-03	6.40E-03	3.54E-04	1.06E-03	131.96	3.67E-04	3.36E-03	132.97
Forklifts	2270003020	75	diesel	109	10	59%	8	3,238	7.48E-04	0.07	6.64E-03	1.15E-03	1.12E-03	1.29E-04	1.81E-04	48.85	5.66E-05	1.24E-03	49.22
Skid Steer Loaders	2270002072	150	diesel	116	10	21%	16	4,822	0.12	0.65	0.40	0.07	0.07	2.67E-04	0.03	72.74	6.15E-03	1.85E-03	73.45
Air compressor	2270006015	50	diesel	102	10	43%	4	779	2.39E-03	0.06	1.19E-02	1.56E-03	1.52E-03	3.40E-05	5.74E-04	11.75	2.59E-04	2.99E-04	11.84
Project Cleanup																			
Front end loader	2270002060	150	diesel	115	12	59%	8	6,997	7.78E-03	0.10	0.04	8.33E-03	8.08E-03	2.89E-04	1.87E-03	105.55	6.16E-04	2.69E-03	106.37
Motor grader	2270002048	100	diesel	110	12	59%	8	4,665	3.62E-03	0.06	0.02	5.99E-03	5.81E-03	1.92E-04	8.74E-04	70.37	3.07E-04	1.79E-03	70.92
Dump Truck	-	-	diesel	302	-	-	8	1,423	3.04E-03	0.05	0.02	1.46E-03	1.34E-03	5.41E-05	-	16.01	3.57E-04	3.48E-05	16.03
Transportation Trucks - material/waste	-	-	diesel	301	-	-	12	2,040	2.74E-03	0.06	0.03	1.14E-03	1.05E-03	7.70E-05	-	22.96	2.89E-04	2.59E-05	22.97
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	305	-	-	1,080	67,465	0.36	2.25	2.48	0.08	0.07	2.57E-03	-	759.27	0.06	3.76E-03	761.82
Worker Commute																			
Light Commercial Truck	-	-	diesel	305	-	-	1,584	98,948	0.53	3.30	3.64	0.11	0.10	3.77E-03	-	1113.60	0.08	5.52E-03	1117.33
Passenger Car	-	-	gasoline	306	-	-	1,056	35,535	0.34	0.22	5.02	8.44E-03	7.47E-03	2.66E-03	-	399.92	0.03	6.30E-03	402.55
							Total	**675,415**	**3.03**	**24.66**	**17.83**	**1.34**	**1.29**	**0.03**	**0.40**	**9,093.78**	**0.29**	**0.17**	**9,150.72**

Notes:
1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2023.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

								Fuel Use	Emissions										
Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	gal	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	107	12	59%	20	23,325	1.42E-02	0.17	0.06	1.27E-02	1.23E-02	9.48E-04	3.43E-03	351.88	9.77E-04	8.96E-03	354.58
Excavator / Backhoe	2270002036	150	diesel	108	12	59%	20	17,494	8.74E-03	0.18	0.06	1.32E-02	1.28E-02	7.07E-04	2.11E-03	263.92	7.35E-04	6.72E-03	265.94
Loader / Skid Steer loader	2270002072	150	diesel	116	12	21%	20	7,233	0.19	0.97	0.59	0.11	0.11	4.01E-04	0.04	109.11	9.23E-03	2.78E-03	110.17
Motor grader	2270002048	100	diesel	110	12	59%	20	11,662	9.04E-03	0.15	0.06	1.50E-02	0.01	4.80E-04	2.19E-03	175.94	7.67E-04	4.48E-03	177.29
Vibratory Roller	2270002015	75	diesel	114	12	59%	15	7,284	8.68E-03	0.23	0.08	1.06E-02	1.03E-02	3.01E-04	2.09E-03	109.89	6.40E-04	2.80E-03	110.74
Dump / Belly Truck	-	-	diesel	302	-	-	60	10,670	0.02	0.40	0.17	1.09E-02	1.01E-02	4.06E-04	-	120.08	2.67E-03	2.61E-04	120.23
Water Truck	-	-	diesel	304	-	-	40	4,136	0.02	0.09	0.06	2.06E-03	1.90E-03	1.56E-04	-	46.54	6.76E-03	2.70E-04	46.79
Fuel Truck	-	-	diesel	304	-	-	10	1,034	3.99E-03	0.02	0.01	5.16E-04	4.75E-04	3.90E-05	-	11.64	1.69E-03	6.74E-05	11.70
Pile Driving (Solar)																			
Telehandler	2270003010	150	diesel	101	12	21%	15	5,442	0.05	0.32	0.17	0.03	0.03	2.53E-04	1.19E-02	82.09	2.71E-03	2.09E-03	82.78
PD10 Pile Driver	2270002081	50	diesel	112	12	59%	25	8,090	0.03	0.61	0.19	0.02	0.02	3.46E-04	6.88E-03	122.05	2.64E-03	3.11E-03	123.04
Tracked Skidsteer	2270002072	150	diesel	116	12	21%	10	3,616	0.09	0.48	0.30	0.06	0.05	2.01E-04	0.02	54.56	4.62E-03	1.39E-03	55.09
Loader Tractor	2270002066	150	diesel	118	12	21%	5	1,811	0.03	0.18	0.10	0.02	0.02	9.50E-05	7.86E-03	27.32	2.06E-03	6.96E-04	27.58
Fuel Truck	-	-	diesel	304	12	-	5	517	1.99E-03	1.15E-02	7.09E-03	2.58E-04	2.37E-04	1.95E-05	-	5.82	8.45E-04	3.37E-05	5.85
Electrical																			
Dozer	2270002069	200	diesel	107	12	59%	4	4,665	2.84E-03	0.03	1.23E-02	2.53E-03	2.46E-03	1.90E-04	6.85E-04	70.38	1.95E-04	1.79E-03	70.92
Tracked Skidsteer	2270002072	150	diesel	116	12	21%	20	7,233	0.19	0.97	0.59	0.11	0.11	4.01E-04	0.04	109.11	9.23E-03	2.78E-03	110.17
Roller	2270002015	75	diesel	114	12	59%	8	3,885	4.63E-03	0.12	0.04	5.64E-03	5.47E-03	1.61E-04	1.12E-03	58.61	3.41E-04	1.49E-03	59.06
Towable Air Compressor	2270006015	50	diesel	102	12	43%	4	934	2.86E-03	0.07	1.42E-02	1.88E-03	1.82E-03	4.07E-05	6.89E-04	14.09	3.11E-04	3.59E-04	14.21
Motor Grader	2270002048	100	diesel	110	12	59%	4	2,332	1.81E-03	0.03	1.21E-02	2.99E-03	2.90E-03	9.60E-05	4.37E-04	35.19	1.53E-04	8.96E-04	35.46
Trench Padder	2270002072	175	diesel	116	12	21%	4	1,688	0.04	0.23	0.14	0.03	0.03	9.36E-05	1.04E-02	25.46	2.15E-03	6.48E-04	25.71
Utility Tractor	2270002066	150	diesel	118	12	21%	4	1,449	0.03	0.15	0.08	0.02	0.02	7.60E-05	6.28E-03	21.85	1.65E-03	5.57E-04	22.06
Telehandler	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Boom Truck	2270003010	150	diesel	101	12	21%	12	4,353	0.04	0.26	0.13	0.03	0.03	2.02E-04	9.51E-03	65.67	2.17E-03	1.67E-03	66.23
Fork Truck for Spool Offload	2270003020	75	diesel	109	12	59%	8	3,886	8.97E-04	0.09	7.96E-03	1.38E-03	1.34E-03	1.55E-04	2.17E-04	58.62	6.80E-05	1.49E-03	59.07
Man Lift Bucket	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Trencher	2270002030	200	diesel	119	12	59%	8	9,327	0.02	0.23	0.07	1.47E-02	0.01	4.01E-04	4.68E-03	140.71	1.30E-03	3.58E-03	141.81
Excavators / Backhoes	2270002036	150	diesel	108	12	59%	8	6,998	3.50E-03	0.07	0.02	5.28E-03	5.12E-03	2.83E-04	8.45E-04	105.57	2.94E-04	2.69E-03	106.38
Winch Truck	2270002051	250	diesel	111	12	59%	8	11,663	3.57E-03	0.04	9.14E-03	1.84E-03	1.79E-03	4.65E-04	8.60E-04	175.95	1.62E-04	4.48E-03	177.29
Water Truck	-	-	diesel	304	-		4	414	1.59E-03	9.21E-03	5.67E-03	2.06E-04	1.90E-04	1.56E-05	-	4.65	6.76E-04	2.70E-05	4.68
Transportation Trucks - materials	-	-	diesel	301	-	-	32	5,440	7.30E-03	0.16	0.08	3.04E-03	2.79E-03	2.05E-04	-	61.22	7.70E-04	6.91E-05	61.26
Substation																			
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	8	6,998	3.50E-03	0.07	0.02	5.28E-03	5.12E-03	2.83E-04	8.45E-04	105.57	2.94E-04	2.69E-03	106.38
Bulldozer	2270002069	200	diesel	107	12	59%	8	9,330	5.69E-03	0.07	0.02	5.06E-03	4.91E-03	3.79E-04	1.37E-03	140.75	3.91E-04	3.58E-03	141.83
Concrete Trucks	2270002042	150	diesel	104	12	43%	16	10,067	0.13	1.44	0.37	0.08	0.07	5.58E-04	0.03	151.87	6.51E-03	3.87E-03	153.19
Drill Rig	2270002033	100	diesel	103	12	43%	8	3,356	0.04	0.47	0.12	0.03	0.03	1.86E-04	9.83E-03	50.63	2.28E-03	1.29E-03	51.07
Man Lift Bucket	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Trencher	2270002030	200	diesel	119	12	59%	8	9,327	0.02	0.23	0.07	1.47E-02	1.43E-02	4.01E-04	4.68E-03	140.71	1.30E-03	3.58E-03	141.81
Winch Truck	2270002051	250	diesel	111	12	59%	4	5,831	1.79E-03	0.02	4.57E-03	9.20E-04	8.93E-04	2.32E-04	4.30E-04	87.98	8.10E-05	2.24E-03	88.65
Cranes	2270002045	200	diesel	106	12	43%	8	6,726	7.87E-03	0.10	0.02	4.39E-03	4.26E-03	2.80E-04	1.89E-03	101.47	5.47E-04	2.58E-03	102.25
Forklifts	2270003020	75	diesel	109	12	59%	8	3,886	8.97E-04	0.09	7.96E-03	1.38E-03	1.34E-03	1.55E-04	2.17E-04	58.62	6.80E-05	1.49E-03	59.07
Skid Steer Loaders	2270002072	150	diesel	116	12	21%	4	1,447	0.04	0.19	0.12	0.02	0.02	8.02E-05	8.91E-03	21.82	1.85E-03	5.56E-04	22.03
Dump Truck (Side or belly dump)	-	-	diesel	302	-	-	16	2,845	6.09E-03	0.11	0.04	2.92E-03	2.68E-03	1.08E-04	-	32.02	7.13E-04	6.96E-05	32.06
Solar Panel Installation																			
Tracked Skidsteer	2270002072	175	diesel	116	12	21%	25	10,548	0.27	1.41	0.87	0.16	0.16	5.85E-04	0.06	159.12	1.35E-02	4.05E-03	160.67
Loader	2270002060	150	diesel	115	12	59%	5	4,373	4.86E-03	0.06	0.02	5.21E-03	5.05E-03	1.81E-04	1.17E-03	65.97	3.85E-04	1.68E-03	66.48
Telehandler	2270003010	150	diesel	101	12	21%	15	5,442	0.05	0.32	0.17	0.03	0.03	2.53E-04	1.19E-02	82.09	2.71E-03	2.09E-03	82.78
Project Cleanup																			
Telehandler	2270003010	150	diesel	101	12	21%	10	3,628	0.03	0.21	0.11	0.02	0.02	1.69E-04	7.92E-03	54.73	1.81E-03	1.39E-03	55.19
Tracked Skidsteer	2270002072	150	diesel	116	12	21%	20	7,233	0.19	0.97	0.59	0.11	0.11	4.01E-04	0.04	109.11	9.23E-03	2.78E-03	110.17
Transportation Trucks - material/waste	-	-	diesel	301	-	-	9	1,530	2.05E-03	0.05	0.02	8.54E-04	7.86E-04	5.78E-05	-	17.22	2.16E-04	1.94E-05	17.23
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	305	-	-	900	56,221	0.30	1.88	2.07	0.06	0.06	2.14E-03	-	632.73	0.05	3.14E-03	634.85
Buggies	-	-	gasoline	306	-	-	384	12,922	0.12	0.08	1.83	3.07E-03	2.72E-03	9.66E-04	-	145.43	1.09E-02	2.29E-03	146.38
Busses	-	-	diesel	303	-	-	72	6,857	0.01	0.14	0.09	3.08E-03	2.84E-03	2.59E-04	-	77.17	1.75E-03	2.61E-04	77.30
							Total	**343,847**	**2.12**	**14.67**	**9.94**	**1.15**	**1.11**	**0.02**	**0.39**	**4,794.30**	**0.16**	**0.10**	**4,827.91**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2023.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm - Construction Emissions
Phase 1 Battery (150 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$PM_{2.5}$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	107	12	59%	4	4,665	2.84E-03	0.03	1.23E-02	2.53E-03	2.46E-03	1.90E-04	6.85E-04	70.38	1.95E-04	1.79E-03	70.92
Excavator / Backhoe	2270002036	150	diesel	108	12	59%	4	3,499	1.75E-03	0.04	1.14E-02	2.64E-03	2.56E-03	1.41E-04	4.22E-04	52.78	1.47E-04	1.34E-03	53.19
Loader / Skid Steer loader	2270002072	150	diesel	116	12	21%	2	723	0.02	0.10	0.06	1.12E-02	1.08E-02	4.01E-05	4.46E-03	10.91	9.23E-04	2.78E-04	11.02
Motor grader	2270002048	100	diesel	110	12	59%	2	1,166	9.04E-04	1.49E-02	6.04E-03	1.50E-03	1.45E-03	4.80E-05	2.19E-04	17.59	7.67E-05	4.48E-04	17.73
Vibratory Roller	2270002015	75	diesel	114	12	59%	2	971	1.16E-03	0.03	1.10E-02	1.41E-03	1.37E-03	4.01E-05	2.79E-04	14.65	8.53E-05	3.73E-04	14.77
Dump / Belly Truck	-	-	diesel	302	-	-	4	711	1.52E-03	0.03	1.11E-02	7.29E-04	6.71E-04	2.71E-05	-	8.01	1.78E-04	1.74E-05	8.02
Water Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Fuel Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	106	12	43%	2	1,681	1.97E-03	0.02	5.50E-03	1.10E-03	1.06E-03	6.99E-05	4.73E-04	25.37	1.37E-04	6.46E-04	25.56
Concrete Truck	2270002042	150	diesel	104	12	43%	8	5,034	0.06	0.72	0.19	0.04	0.04	2.79E-04	0.02	75.94	3.25E-03	1.93E-03	76.59
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	4	3,499	1.75E-03	0.04	1.14E-02	2.64E-03	2.56E-03	1.41E-04	4.22E-04	52.78	1.47E-04	1.34E-03	53.19
Forklifts	2270003020	75	diesel	109	12	59%	4	1,943	4.49E-04	0.04	3.98E-03	6.91E-04	6.71E-04	7.74E-05	1.08E-04	29.31	3.40E-05	7.46E-04	29.53
Skid Steer loader	2270002072	150	diesel	116	12	21%	2	723	0.02	0.10	0.06	1.12E-02	1.08E-02	4.01E-05	4.46E-03	10.91	9.23E-04	2.78E-04	11.02
Dump Truck	-	-	diesel	302	-	-	4	711	1.52E-03	0.03	1.11E-02	7.29E-04	6.71E-04	2.71E-05	-	8.01	1.78E-04	1.74E-05	8.02
Transportation Trucks - materials	-	-	diesel	301	-	-	4	680	9.12E-04	0.02	9.58E-03	3.80E-04	3.49E-04	2.57E-05	-	7.65	9.62E-05	8.63E-06	7.66
Water Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Fuel Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Electrical																			
Boom Truck	2270003010	150	diesel	101	12	21%	2	726	6.59E-03	0.04	0.02	4.45E-03	4.32E-03	3.37E-05	1.58E-03	10.95	3.62E-04	2.79E-04	11.04
Fork Truck for Spool Offload	2270003020	75	diesel	109	12	59%	2	971	2.24E-04	0.02	1.99E-03	3.46E-04	3.35E-04	3.87E-05	5.42E-05	14.65	1.70E-05	3.73E-04	14.77
Man Lift Bucket	2270003010	150	diesel	101	12	21%	2	726	6.59E-03	0.04	0.02	4.45E-03	4.32E-03	3.37E-05	1.58E-03	10.95	3.62E-04	2.79E-04	11.04
Trencher	2270002030	200	diesel	119	12	59%	2	2,332	4.87E-03	0.06	0.02	3.67E-03	3.56E-03	1.00E-04	1.17E-03	35.18	3.26E-04	8.96E-04	35.45
Excavators / Backhoes	2270002036	150	diesel	108	12	59%	2	1,749	8.74E-04	0.02	5.72E-03	1.32E-03	1.28E-03	7.07E-05	2.11E-04	26.39	7.35E-05	6.72E-04	26.59
Transportation Trucks - materials	-	-	diesel	301	-	-	4	680	9.12E-04	0.02	9.58E-03	3.80E-04	3.49E-04	2.57E-05	-	7.65	9.62E-05	8.63E-06	7.66
Project Cleanup																			
Front end loader	2270002060	150	diesel	115	12	59%	1	875	9.72E-04	1.22E-02	4.79E-03	1.04E-03	1.01E-03	3.61E-05	2.34E-04	13.19	7.69E-05	3.36E-04	13.30
Motor grader	2270002048	100	diesel	110	12	59%	1	583	4.52E-04	7.43E-03	3.02E-03	7.49E-04	7.26E-04	2.40E-05	1.09E-04	8.80	3.84E-05	2.24E-04	8.86
Dump Truck	-	-	diesel	302	-	-	1	178	3.80E-04	6.63E-03	2.79E-03	1.82E-04	1.68E-04	6.76E-06	-	2.00	4.46E-05	4.35E-06	2.00
Transportation Trucks - material/waste	-	-	diesel	301	-	-	1	170	2.28E-04	5.05E-03	2.39E-03	9.49E-05	8.73E-05	6.42E-06	-	1.91	2.41E-05	2.16E-06	1.91
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	305	-	-	400	24,987	0.13	0.83	0.92	0.03	0.03	9.53E-04	-	281.21	0.02	1.39E-03	282.16
							Total	**60,810**	**0.27**	**2.29**	**1.42**	**0.12**	**0.11**	**2.51E-03**	**0.03**	**806.49**	**0.03**	**1.37E-02**	**811.34**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2023.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm - Construction Emissions
Phase 2a Wind (250 MW)

								Fuel Use	Emissions										
Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	gal	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	32	37,320	0.02	0.22	0.07	1.43E-02	1.39E-02	1.50E-03	4.34E-03	563.02	1.13E-03	1.43E-02	567.33
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	32	27,991	1.09E-02	0.23	0.07	0.02	1.47E-02	1.12E-03	2.62E-03	422.28	8.82E-04	1.08E-02	425.50
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	32	11,573	0.29	1.53	0.94	0.18	0.17	6.42E-04	0.07	174.59	0.02	4.45E-03	176.30
Motor grader	2270002048	100	diesel	210	12	59%	32	18,660	1.02E-02	0.18	0.07	0.02	0.02	7.57E-04	2.46E-03	281.51	8.44E-04	7.17E-03	283.67
Vibratory Roller	2270002015	75	diesel	214	12	59%	24	11,655	1.02E-02	0.33	0.10	1.34E-02	1.30E-02	4.77E-04	2.47E-03	175.84	7.92E-04	4.48E-03	177.19
Dump / Belly Truck	-	-	diesel	402	-	-	96	16,839	0.03	0.59	0.26	1.44E-02	1.33E-02	6.39E-04	-	189.51	4.20E-03	4.17E-04	189.74
Water Truck	-	-	diesel	404	-	-	64	6,497	0.02	0.14	0.09	2.81E-03	2.58E-03	2.45E-04	-	73.12	1.08E-02	4.31E-04	73.52
Fuel Truck	-	-	diesel	404	-	-	16	1,624	6.06E-03	0.03	0.02	7.01E-04	6.45E-04	6.12E-05	-	18.28	2.70E-03	1.08E-04	18.38
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	12	10,089	9.11E-03	0.11	0.03	5.07E-03	4.92E-03	4.14E-04	2.19E-03	152.21	6.27E-04	3.88E-03	153.38
Concrete pump truck	2270002042	200	diesel	205	12	43%	8	6,713	0.07	0.89	0.22	0.04	0.04	3.72E-04	0.02	101.28	3.78E-03	2.58E-03	102.14
Concrete Truck	2270002042	150	diesel	204	12	43%	64	40,269	0.50	5.69	1.47	0.30	0.29	2.23E-03	0.12	607.51	0.03	0.02	612.79
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	16	13,995	5.43E-03	0.12	0.03	7.55E-03	7.33E-03	5.62E-04	1.31E-03	211.14	4.41E-04	5.38E-03	212.75
Forklifts	2270003020	75	diesel	209	12	59%	12	5,828	1.19E-03	0.13	9.02E-03	1.62E-03	1.57E-03	2.32E-04	2.88E-04	87.93	8.72E-05	2.24E-03	88.60
Skid Steer loader	2270002072	150	diesel	216	12	21%	8	2,893	0.07	0.38	0.23	0.04	0.04	1.60E-04	0.02	43.65	3.78E-03	1.11E-03	44.07
Dump Truck	-	-	diesel	402	-	-	24	4,210	8.02E-03	0.15	0.06	3.61E-03	3.32E-03	1.60E-04	-	47.38	1.05E-03	1.04E-04	47.43
Transportation Trucks - materials	-	-	diesel	401	-	-	24	3,993	5.07E-03	0.11	0.06	1.98E-03	1.83E-03	1.51E-04	-	44.94	5.54E-04	5.18E-05	44.97
Water Truck	-	-	diesel	404	-	-	12	1,218	4.55E-03	0.03	0.02	5.26E-04	4.84E-04	4.59E-05	-	13.71	2.02E-03	8.08E-05	13.79
Fuel Truck	-	-	diesel	404	-	-	8	812	3.03E-03	0.02	1.10E-02	3.51E-04	3.23E-04	3.06E-05	-	9.14	1.35E-03	5.39E-05	9.19
Electrical																			
Boom Truck	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	12	5,828	1.19E-03	0.13	9.02E-03	1.62E-03	1.57E-03	2.32E-04	2.88E-04	87.93	8.72E-05	2.24E-03	88.60
Man Lift Bucket	2270003010	150	diesel	201	12	21%	12	4,354	0.04	0.24	0.12	0.02	0.02	2.00E-04	8.67E-03	65.68	2.04E-03	1.67E-03	66.23
Trencher	2270002030	200	diesel	219	12	59%	12	13,992	0.02	0.29	0.09	0.02	0.02	5.93E-04	5.88E-03	211.08	1.64E-03	5.38E-03	212.73
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	12	10,497	4.07E-03	0.09	0.03	5.66E-03	5.49E-03	4.21E-04	9.84E-04	158.35	3.31E-04	4.03E-03	159.56
Winch Truck	2270002051	250	diesel	211	12	59%	8	11,663	3.34E-03	0.04	0.01	1.56E-03	1.51E-03	4.64E-04	8.05E-04	175.95	1.41E-04	4.48E-03	177.29
Transportation Trucks - materials	-	-	diesel	401	-	-	32	5,324	6.76E-03	0.15	0.07	2.65E-03	2.43E-03	2.01E-04	-	59.91	7.39E-04	6.91E-05	59.95
Substation																			
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	20	17,494	6.79E-03	0.14	0.04	9.44E-03	9.16E-03	7.02E-04	1.64E-03	263.92	5.52E-04	6.72E-03	265.94
Bulldozer	2270002069	200	diesel	207	12	59%	20	23,325	1.13E-02	0.13	0.04	8.96E-03	8.69E-03	9.40E-04	2.71E-03	351.89	7.09E-04	8.96E-03	354.58
Concrete Trucks	2270002042	150	diesel	204	12	43%	40	25,168	0.31	3.56	0.92	0.19	0.18	1.40E-03	0.07	379.70	0.02	9.67E-03	382.99
Drill Rig	2270002033	100	diesel	203	12	43%	20	8,390	0.10	1.14	0.29	0.07	0.06	4.63E-04	0.02	126.58	5.67E-03	3.22E-03	127.68
Man Lift Bucket	2270003010	150	diesel	201	12	21%	20	7,256	0.06	0.39	0.20	0.04	0.04	3.34E-04	1.44E-02	109.47	3.40E-03	2.79E-03	110.39
Trencher	2270002030	200	diesel	219	12	59%	20	23,320	0.04	0.48	0.15	0.03	0.03	9.89E-04	9.81E-03	351.81	2.73E-03	8.96E-03	354.55
Winch Truck	2270002051	250	diesel	211	12	59%	10	14,579	4.18E-03	0.05	9.67E-03	1.95E-03	1.89E-03	5.80E-04	1.01E-03	219.94	1.76E-04	5.60E-03	221.61
Cranes	2270002045	200	diesel	206	12	43%	20	16,815	0.02	0.18	0.04	8.45E-03	8.19E-03	6.91E-04	3.65E-03	253.68	1.05E-03	6.46E-03	255.63
Forklifts	2270003020	75	diesel	209	12	59%	20	9,714	1.98E-03	0.21	0.02	2.70E-03	2.62E-03	3.86E-04	4.79E-04	146.55	1.45E-04	3.73E-03	147.67
Skid Steer Loaders	2270002072	150	diesel	216	12	21%	10	3,617	0.09	0.48	0.29	0.06	0.05	2.01E-04	0.02	54.56	4.73E-03	1.39E-03	55.09
Dump Truck (Side or belly dump)	-	-	diesel	402	-	-	40	7,016	1.34E-02	0.24	0.11	6.02E-03	5.54E-03	2.66E-04	-	78.96	1.75E-03	1.74E-04	79.06
Wind Turbine Assembly & Erection																			
Man Lift Bucket	2270003010	150	diesel	201	12	21%	40	14,513	0.12	0.79	0.41	0.08	0.08	6.67E-04	0.03	218.95	6.81E-03	5.58E-03	220.78
Forklift	2270003020	75	diesel	209	12	59%	20	9,714	1.98E-03	0.21	0.02	2.70E-03	2.62E-03	3.86E-04	4.79E-04	146.55	1.45E-04	3.73E-03	147.67
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	50	42,038	0.04	0.46	0.11	0.02	0.02	1.73E-03	9.13E-03	634.19	2.61E-03	0.02	639.07
Track mounted cranes	2270002045	200	diesel	206	12	43%	12	10,089	9.11E-03	0.11	0.03	5.07E-03	4.92E-03	4.14E-04	2.19E-03	152.21	6.27E-04	3.88E-03	153.38
Transportation Trucks - materials & equi	-	-	diesel	401	-	-	252	41,924	5.32E-02	1.19	0.58	0.02	0.02	1.58E-03	-	471.83	5.82E-03	5.44E-04	472.13
Transmission Line																			
Cranes	2270002045	200	diesel	206	8	43%	8	4,484	4.05E-03	0.05	1.14E-02	2.25E-03	2.18E-03	1.84E-04	9.74E-04	67.65	2.79E-04	1.72E-03	68.17
Bucket Trucks	2270003010	150	diesel	201	8	21%	20	4,838	0.04	0.26	0.14	0.03	0.03	2.22E-04	9.63E-03	72.98	2.27E-03	1.86E-03	73.59
Wire Pullers	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Wire Tensioners	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Excavators or Backhoes	2270002036	150	diesel	208	4	59%	18	5,248	2.04E-03	0.04	1.31E-02	2.83E-03	2.75E-03	2.11E-04	4.92E-04	79.18	1.65E-04	2.02E-03	79.78
Forklifts	2270003020	75	diesel	209	4	59%	12	1,943	3.97E-04	0.04	3.01E-03	5.41E-04	5.25E-04	7.73E-05	9.59E-05	29.31	2.91E-05	7.46E-04	29.53
Truck / track diggers	2270002036	150	diesel	208	6	59%	4	1,749	6.79E-04	1.45E-02	4.35E-03	9.44E-04	9.16E-04	7.02E-05	1.64E-04	26.39	5.52E-05	6.72E-04	26.59
Dozers	2270002069	200	diesel	207	4	59%	5	1,944	9.39E-04	1.12E-02	3.64E-03	7.47E-04	7.24E-04	7.83E-05	2.26E-04	29.32	5.91E-05	7.47E-04	29.55
UTVs	2270001060	75	diesel	217	2	21%	6	201	2.68E-03	0.02	1.32E-02	1.79E-03	1.74E-03	9.71E-06	6.44E-04	3.04	1.07E-04	7.73E-05	3.06
Tractor	2270002066	150	diesel	218	6	21%	4	725	1.13E-02	0.06	0.04	7.33E-03	7.11E-03	3.68E-05	2.72E-03	10.93	7.19E-04	2.78E-04	11.03
Skid Steer Loaders	2270002072	150	diesel	216	6	21%	12	2,170	0.05	0.29	0.18	0.03	0.03	1.20E-04	1.32E-02	32.74	2.84E-03	8.34E-04	33.06
Underground boring equipment	2270002033	100	diesel	203	8	43%	12	3,356	0.04	0.45	0.12	0.03	0.03	1.85E-04	9.55E-03	50.63	2.27E-03	1.29E-03	51.07
Tractor Trailers	-	-	diesel	401	-	-	6	998	1.27E-03	0.03	1.39E-02	4.96E-04	4.56E-04	3.76E-05	-	11.23	1.39E-04	1.30E-05	11.24
Fuel Trucks / Trailers	-	-	diesel	404	-	-	6	609	2.27E-03	1.29E-02	8.23E-03	2.63E-04	2.42E-04	2.30E-05	-	6.86	1.01E-03	4.04E-05	6.89
O&M Building																			
Excavators or Backhoes	2270002036	150	diesel	208	10	59%	12	8,747	3.39E-03	0.07	0.02	4.72E-03	4.58E-03	3.51E-04	8.20E-04	131.96	2.76E-04	3.36E-03	132.97
Forklifts	2270003020	75	diesel	209	10	59%	8	3,238	6.61E-04	0.07	5.01E-03	9.01E-04	8.74E-04	1.29E-04	1.60E-04	48.85	4.85E-05	1.24E-03	49.22
Skid Steer Loaders	2270002072	150	diesel	216	10	21%	16	4,822	0.12	0.64	0.39	0.07	0.07	2.67E-04	0.03	72.75	6.31E-03	1.85E-03	73.46
Air compressor	2270006015	50	diesel	202	10	43%	4	779	2.14E-03	0.06	1.04E-02	1.32E-03	1.28E-03	3.34E-05	5.14E-04	11.75	2.47E-04	2.99E-04	11.84
Project Cleanup																			
Front end loader	2270002060	150	diesel	215	12	59%	8	6,997	5.91E-03	0.08	0.03	6.87E-03	6.66E-03	2.86E-04	1.43E-03	105.56	4.68E-04	2.69E-03	106.37
Motor grader	2270002048	100	diesel	210	12	59%	8	4,665	2.55E-03	0.04	0.02	3.95E-03	3.84E-03	1.89E-04	6.16E-04	70.38	2.11E-04	1.79E-03	70.92
Dump Truck	-	-	diesel	402	-	-	8	1,403	2.67E-03	0.05	0.02	1.20E-03	1.11E-03	5.32E-05	-	15.79	3.50E-04	3.48E-05	15.81
Transportation Trucks - material/waste	-	-	diesel	401	-	-	12	1,996	2.53E-03	0.06	0.03	9.92E-04	9.13E-04	7.53E-05	-	22.47	2.77E-04	2.59E-05	22.48
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	405	-	-	1,400	84,833	0.41	2.58	2.79	0.09	0.09	3.23E-03	-	954.75	0.07	4.88E-03	958.05
Worker Commute																			
Light Commercial Truck	-	-	diesel	405	-	-	1,412	85,560	0.41	2.60	2.82	0.10	0.09	3.26E-03	-	962.93	0.07	4.92E-03	966.26
Passenger Car	-	-	gasoline	406	-	-	942	30,938	0.28	0.16	4.33	7.47E-03	6.61E-03	2.31E-03	-	348.19	0.02	5.36E-03	350.41
							Total	**817,455**	**3.47**	**29.48**	**18.44**	**1.68**	**1.62**	**0.04**	**0.53**	**11,198.93**	**0.33**	**0.22**	**11,272.03**

Notes:
1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm - Construction Emissions
Phase 2a Solar (250 MW)

								Fuel Use					Emissions						
Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	gal	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	16	18,660	9.01E-03	0.11	0.03	7.17E-03	6.95E-03	7.52E-04	2.17E-03	281.51	5.67E-04	7.17E-03	283.66
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	16	13,995	5.43E-03	0.12	0.03	7.55E-03	7.33E-03	5.62E-04	1.31E-03	211.14	4.41E-04	5.38E-03	212.75
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	16	5,787	0.15	0.76	0.47	0.09	0.09	3.21E-04	0.04	87.30	7.57E-03	2.22E-03	88.15
Motor grader	2270002048	100	diesel	210	12	59%	16	9,330	5.10E-03	0.09	0.03	7.91E-03	7.67E-03	3.78E-04	1.23E-03	140.75	4.22E-04	3.58E-03	141.83
Vibratory Roller	2270002015	75	diesel	214	12	59%	12	5,828	5.11E-03	0.17	0.05	6.72E-03	6.52E-03	2.38E-04	1.23E-03	87.92	3.96E-04	2.24E-03	88.60
Dump / Belly Truck	-	-	diesel	402	-	-	48	8,419	0.02	0.29	0.13	7.22E-03	6.64E-03	3.19E-04	-	94.76	2.10E-03	2.09E-04	94.87
Water Truck	-	-	diesel	404	-	-	32	3,249	1.21E-02	0.07	0.04	1.40E-03	1.29E-03	1.22E-04	-	36.56	5.39E-03	2.15E-04	36.76
Fuel Truck	-	-	diesel	404	-	-	8	812	3.03E-03	0.02	1.10E-02	3.51E-04	3.23E-04	3.06E-05	-	9.14	1.35E-03	5.39E-05	9.19
Pile Driving (Solar)																			
Telehandler	2270003010	150	diesel	201	12	21%	15	5,442	0.05	0.29	0.15	0.03	0.03	2.50E-04	1.08E-02	82.11	2.55E-03	2.09E-03	82.79
PD10 Pile Driver	2270002081	50	diesel	212	12	59%	25	8,090	0.03	0.59	0.16	0.02	0.02	3.42E-04	6.04E-03	122.06	2.50E-03	3.11E-03	123.04
Tracked Skidsteer	2270002072	150	diesel	216	12	21%	10	3,617	0.09	0.48	0.29	0.06	0.05	2.01E-04	0.02	54.56	4.73E-03	1.39E-03	55.09
Loader Tractor	2270002066	150	diesel	218	12	21%	5	1,812	0.03	0.16	0.09	0.02	0.02	9.21E-05	6.79E-03	27.33	1.80E-03	6.96E-04	27.58
Fuel Truck	-	-	diesel	404	-	-	5	508	1.89E-03	1.08E-02	6.86E-03	2.19E-04	2.02E-04	1.91E-05	-	5.71	8.43E-04	3.37E-05	5.74
Electrical																			
Dozer	2270002069	200	diesel	207	12	59%	4	4,665	2.25E-03	0.03	8.73E-03	1.79E-03	1.74E-03	1.88E-04	5.43E-04	70.38	1.42E-04	1.79E-03	70.92
Tracked Skidsteer	2270002072	150	diesel	216	12	21%	20	7,233	0.18	0.96	0.58	0.11	0.11	4.01E-04	0.04	109.12	9.46E-03	2.78E-03	110.19
Roller	2270002015	75	diesel	214	12	59%	8	3,885	3.41E-03	0.11	0.03	4.48E-03	4.34E-03	1.59E-04	8.22E-04	58.61	2.64E-04	1.49E-03	59.06
Towable Air Compressor	2270006015	50	diesel	202	12	43%	4	934	2.56E-03	0.07	1.25E-02	1.59E-03	1.54E-03	4.00E-05	6.16E-04	14.10	2.96E-04	3.59E-04	14.21
Motor Grader	2270002048	100	diesel	210	12	59%	4	2,332	1.27E-03	0.02	8.38E-03	1.98E-03	1.92E-03	9.46E-05	3.08E-04	35.19	1.05E-04	8.96E-04	35.46
Trench Padder	2270002072	175	diesel	216	12	21%	4	1,688	0.04	0.22	0.14	0.03	0.02	9.36E-05	1.03E-02	25.46	2.21E-03	6.48E-04	25.71
Utility Tractor	2270002066	150	diesel	218	12	21%	4	1,449	0.02	0.13	0.07	1.47E-02	1.42E-02	7.37E-05	5.43E-03	21.86	1.44E-03	5.57E-04	22.07
Telehandler	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Boom Truck	2270003010	150	diesel	201	12	21%	12	4,354	0.04	0.24	0.12	0.02	0.02	2.00E-04	8.67E-03	65.68	2.04E-03	1.67E-03	66.23
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	8	3,886	7.93E-04	0.08	6.01E-03	1.08E-03	1.05E-03	1.55E-04	1.92E-04	58.62	5.81E-05	1.49E-03	59.07
Man Lift Bucket	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Trencher	2270002030	200	diesel	219	12	59%	8	9,328	0.02	0.19	0.06	1.21E-02	1.17E-02	3.96E-04	3.92E-03	140.72	1.09E-03	3.58E-03	141.82
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	8	6,998	2.72E-03	0.06	0.02	3.78E-03	3.66E-03	2.81E-04	6.56E-04	105.57	2.21E-04	2.69E-03	106.38
Winch Truck	2270002051	250	diesel	211	12	59%	12	17,494	5.02E-03	0.06	1.16E-02	2.34E-03	2.27E-03	6.96E-04	1.21E-03	263.93	2.11E-04	6.72E-03	265.94
Water Truck	-	-	diesel	404	-	-	4	406	1.52E-03	8.61E-03	5.49E-03	1.75E-04	1.61E-04	1.53E-05	-	4.57	6.74E-04	2.69E-05	4.60
Transportation Trucks - materials	-	-	diesel	401	-	-	32	5,324	6.76E-03	0.15	0.07	2.65E-03	2.43E-03	2.01E-04	-	59.91	7.39E-04	6.91E-05	59.95
Substation																			
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	8	6,998	2.72E-03	0.06	0.02	3.78E-03	3.66E-03	2.81E-04	6.56E-04	105.57	2.21E-04	2.69E-03	106.38
Bulldozer	2270002069	200	diesel	207	12	59%	8	9,330	4.50E-03	0.05	0.02	3.58E-03	3.48E-03	3.76E-04	1.09E-03	140.76	2.83E-04	3.58E-03	141.83
Concrete Trucks	2270002042	150	diesel	204	12	43%	16	10,067	0.12	1.42	0.37	0.08	0.07	5.58E-04	0.03	151.88	6.67E-03	3.87E-03	153.20
Drill Rig	2270002033	100	diesel	203	12	43%	8	3,356	0.04	0.45	0.12	0.03	0.03	1.85E-04	9.55E-03	50.63	2.27E-03	1.29E-03	51.07
Man Lift Bucket	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Trencher	2270002030	200	diesel	219	12	59%	8	9,328	0.02	0.19	0.06	1.21E-02	1.17E-02	3.96E-04	3.92E-03	140.72	1.09E-03	3.58E-03	141.82
Winch Truck	2270002051	250	diesel	211	12	59%	4	5,831	1.67E-03	0.02	3.87E-03	7.79E-04	7.56E-04	2.32E-04	4.02E-04	87.98	7.03E-05	2.24E-03	88.65
Cranes	2270002045	200	diesel	206	12	43%	8	6,726	6.08E-03	0.07	0.02	3.38E-03	3.28E-03	2.76E-04	1.46E-03	101.47	4.18E-04	2.58E-03	102.25
Forklifts	2270003020	75	diesel	209	12	59%	8	3,886	7.93E-04	0.08	6.01E-03	1.08E-03	1.05E-03	1.55E-04	1.92E-04	58.62	5.81E-05	1.49E-03	59.07
Skid Steer Loaders	2270002072	150	diesel	216	12	21%	4	1,447	0.04	0.19	0.12	0.02	0.02	8.02E-05	8.79E-03	21.82	1.89E-03	5.56E-04	22.04
Dump Truck (Side or belly dump)	-	-	diesel	402	-	-	16	2,806	5.35E-03	0.10	0.04	2.41E-03	2.21E-03	1.06E-04	-	31.59	7.00E-04	6.95E-05	31.62
Solar Panel Installation																			
Tracked Skidsteer	2270002072	175	diesel	216	12	21%	25	10,548	0.27	1.39	0.85	0.16	0.16	5.85E-04	0.06	159.14	1.38E-02	4.05E-03	160.69
Loader	2270002060	150	diesel	215	12	59%	5	4,373	3.70E-03	0.05	0.02	4.29E-03	4.16E-03	1.79E-04	8.91E-04	65.98	2.92E-04	1.68E-03	66.48
Telehandler	2270003010	150	diesel	201	12	21%	15	5,442	0.05	0.29	0.15	0.03	0.03	2.50E-04	1.08E-02	82.11	2.55E-03	2.09E-03	82.79
Project Cleanup																			
Telehandler	2270003010	150	diesel	201	12	21%	10	3,628	0.03	0.20	0.10	0.02	0.02	1.67E-04	7.22E-03	54.74	1.70E-03	1.39E-03	55.19
Tracked Skidsteer	2270002072	150	diesel	216	12	21%	20	7,233	0.18	0.96	0.58	0.11	0.11	4.01E-04	0.04	109.12	9.46E-03	2.78E-03	110.19
Transportation Trucks - material/waste	-	-	diesel	401	-	-	9	1,497	1.90E-03	0.04	0.02	7.44E-04	6.85E-04	5.65E-05	-	16.85	2.08E-04	1.94E-05	16.86
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	405	-	-	825	49,991	0.24	1.52	1.65	0.06	0.05	1.90E-03	-	562.62	0.04	2.87E-03	564.56
Buggies	-	-	gasoline	406	-	-	352	11,561	0.11	0.06	1.62	2.79E-03	2.47E-03	8.64E-04	-	130.11	9.33E-03	2.00E-03	130.94
Busses	-	-	diesel	403	-	-	66	6,175	8.76E-03	0.12	0.08	2.85E-03	2.62E-03	2.33E-04	-	69.50	1.54E-03	2.39E-04	69.61
							Total	**324,457**	**1.92**	**13.23**	**8.75**	**1.05**	**1.01**	**1.43E-02**	**0.36**	**4,547.13**	**0.15**	**0.10**	**4,579.36**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm - Construction Emissions
Phase 2a Battery (150 MW)

								Fuel Use	Emissions										
Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	gal	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	4	4,665	2.25E-03	0.03	8.73E-03	1.79E-03	1.74E-03	1.88E-04	5.43E-04	70.38	1.42E-04	1.79E-03	70.92
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	4	3,499	1.36E-03	0.03	8.70E-03	1.89E-03	1.83E-03	1.40E-04	3.28E-04	52.78	1.10E-04	1.34E-03	53.19
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	2	723	0.02	0.10	0.06	1.10E-02	1.07E-02	4.01E-05	4.40E-03	10.91	9.46E-04	2.78E-04	11.02
Motor grader	2270002048	100	diesel	210	12	59%	2	1,166	6.37E-04	1.12E-02	4.19E-03	9.88E-04	9.59E-04	4.73E-05	1.54E-04	17.59	5.27E-05	4.48E-04	17.73
Vibratory Roller	2270002015	75	diesel	214	12	59%	2	971	8.52E-04	0.03	8.55E-03	1.12E-03	1.09E-03	3.97E-05	2.05E-04	14.65	6.60E-05	3.73E-04	14.77
Dump / Belly Truck	-	-	diesel	402	-	-	4	702	1.34E-03	0.02	1.07E-02	6.02E-04	5.54E-04	2.66E-05	-	7.90	1.75E-04	1.74E-05	7.91
Water Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Fuel Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	2	1,682	1.52E-03	0.02	4.29E-03	8.45E-04	8.19E-04	6.91E-05	3.65E-04	25.37	1.05E-04	6.46E-04	25.56
Concrete Truck	2270002042	150	diesel	204	12	43%	8	5,034	0.06	0.71	0.18	0.04	0.04	2.79E-04	1.49E-02	75.94	3.33E-03	1.93E-03	76.60
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	4	3,499	1.36E-03	0.03	8.70E-03	1.89E-03	1.83E-03	1.40E-04	3.28E-04	52.78	1.10E-04	1.34E-03	53.19
Forklifts	2270003020	75	diesel	209	12	59%	4	1,943	3.97E-04	0.04	3.01E-03	5.41E-04	5.25E-04	7.73E-05	9.59E-05	29.31	2.91E-05	7.46E-04	29.53
Skid Steer loader	2270002072	150	diesel	216	12	21%	2	723	0.02	0.10	0.06	1.10E-02	1.07E-02	4.01E-05	4.40E-03	10.91	9.46E-04	2.78E-04	11.02
Dump Truck	-	-	diesel	402	-	-	4	702	1.34E-03	0.02	1.07E-02	6.02E-04	5.54E-04	2.66E-05	-	7.90	1.75E-04	1.74E-05	7.91
Transportation Trucks - materials	-	-	diesel	401	-	-	4	665	8.45E-04	0.02	9.26E-03	3.31E-04	3.04E-04	2.51E-05	-	7.49	9.24E-05	8.63E-06	7.49
Water Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Fuel Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Electrical																			
Boom Truck	2270003010	150	diesel	201	12	21%	2	726	6.00E-03	0.04	0.02	4.07E-03	3.95E-03	3.34E-05	1.44E-03	10.95	3.40E-04	2.79E-04	11.04
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	2	971	1.98E-04	0.02	1.50E-03	2.70E-04	2.62E-04	3.86E-05	4.79E-05	14.66	1.45E-05	3.73E-04	14.77
Man Lift Bucket	2270003010	150	diesel	201	12	21%	2	726	6.00E-03	0.04	0.02	4.07E-03	3.95E-03	3.34E-05	1.44E-03	10.95	3.40E-04	2.79E-04	11.04
Trencher	2270002030	200	diesel	219	12	59%	2	2,332	4.07E-03	0.05	0.02	3.03E-03	2.94E-03	9.89E-05	9.81E-04	35.18	2.73E-04	8.96E-04	35.45
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	2	1,749	6.79E-04	1.45E-02	4.35E-03	9.44E-04	9.16E-04	7.02E-05	1.64E-04	26.39	5.52E-05	6.72E-04	26.59
Transportation Trucks - materials	-	-	diesel	401	-	-	4	665	8.45E-04	0.02	9.26E-03	3.31E-04	3.04E-04	2.51E-05	-	7.49	9.24E-05	8.63E-06	7.49
Project Cleanup																			
Front end loader	2270002060	150	diesel	215	12	59%	1	875	7.39E-04	9.78E-03	3.89E-03	8.58E-04	8.33E-04	3.58E-05	1.78E-04	13.20	5.85E-05	3.36E-04	13.30
Motor grader	2270002048	100	diesel	210	12	59%	1	583	3.19E-04	5.58E-03	2.09E-03	4.94E-04	4.79E-04	2.36E-05	7.70E-05	8.80	2.64E-05	2.24E-04	8.86
Dump Truck	-	-	diesel	402	-	-	1	175	3.34E-04	6.09E-03	2.67E-03	1.50E-04	1.38E-04	6.66E-06	-	1.97	4.37E-05	4.35E-06	1.98
Transportation Trucks - material/waste	-	-	diesel	401	-	-	1	166	2.11E-04	4.72E-03	2.32E-03	8.27E-05	7.61E-05	6.27E-06	-	1.87	2.31E-05	2.16E-06	1.87
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	405	-	-	400	24,238	0.12	0.74	0.80	0.03	0.02	9.23E-04	-	272.79	0.02	1.39E-03	273.73
							Total	**59,993**	**0.25**	**2.12**	**1.27**	**0.11**	**0.11**	**2.47E-03**	**0.03**	**797.29**	**0.03**	**1.37E-02**	**802.14**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e. 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm - Construction Emissions
Phase 2b Wind (500 MW)

								Fuel Use	Emissions										
Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	gal	VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	32	37,320	0.02	0.22	0.07	1.43E-02	1.39E-02	1.50E-03	4.34E-03	563.02	1.13E-03	1.43E-02	567.33
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	32	27,991	1.09E-02	0.23	0.07	0.02	1.47E-02	1.12E-03	2.62E-03	422.28	8.82E-04	1.08E-02	425.50
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	32	11,573	0.29	1.53	0.94	0.18	0.17	6.42E-04	0.07	174.59	0.02	4.45E-03	176.30
Motor grader	2270002048	100	diesel	210	12	59%	32	18,660	1.02E-02	0.18	0.07	0.02	0.02	7.57E-04	2.46E-03	281.51	8.44E-04	7.17E-03	283.67
Vibratory Roller	2270002015	75	diesel	214	12	59%	24	11,655	1.02E-02	0.33	0.10	1.34E-02	1.30E-02	4.77E-04	2.47E-03	175.84	7.92E-04	4.48E-03	177.19
Dump / Belly Truck	-	-	diesel	402	-	-	96	16,839	0.03	0.59	0.26	1.44E-02	1.33E-02	6.39E-04	-	189.51	4.20E-03	4.17E-04	189.74
Water Truck	-	-	diesel	404	-	-	64	6,497	0.02	0.14	0.09	2.81E-03	2.58E-03	2.45E-04	-	73.12	1.08E-02	4.31E-04	73.52
Fuel Truck	-	-	diesel	404	-	-	16	1,624	6.06E-03	0.03	0.02	7.01E-04	6.45E-04	6.12E-05	-	18.28	2.70E-03	1.08E-04	18.38
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	18	15,134	1.37E-02	0.16	0.04	7.60E-03	7.37E-03	6.22E-04	3.29E-03	228.31	9.41E-04	5.81E-03	230.07
Concrete pump truck	2270002042	200	diesel	205	12	43%	12	10,070	0.11	1.33	0.33	0.06	0.06	5.59E-04	0.03	151.92	5.67E-03	3.87E-03	153.22
Concrete Truck	2270002042	150	diesel	204	12	43%	96	60,404	0.74	8.53	2.20	0.45	0.44	3.35E-03	0.18	911.27	0.04	0.02	919.19
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	24	20,993	8.15E-03	0.17	0.05	1.13E-02	1.10E-02	8.43E-04	1.97E-03	316.71	6.62E-04	8.07E-03	319.13
Forklifts	2270003020	75	diesel	209	12	59%	18	8,743	1.78E-03	0.19	1.35E-02	2.43E-03	2.36E-03	3.48E-04	4.31E-04	131.90	1.31E-04	3.36E-03	132.90
Skid Steer loader	2270002072	150	diesel	216	12	21%	12	4,340	0.11	0.57	0.35	0.07	0.06	2.41E-04	0.03	65.47	5.68E-03	1.67E-03	66.11
Dump Truck	-	-	diesel	402	-	-	36	6,315	1.20E-02	0.22	0.10	5.42E-03	4.98E-03	2.40E-04	-	71.07	1.57E-03	1.56E-04	71.15
Transportation Trucks - materials	-	-	diesel	401	-	-	36	5,989	7.60E-03	0.17	0.08	2.98E-03	2.74E-03	2.26E-04	-	67.40	8.32E-04	7.77E-05	67.45
Water Truck	-	-	diesel	404	-	-	24	2,436	9.09E-03	0.05	0.03	1.05E-03	9.68E-04	9.19E-05	-	27.42	4.05E-03	1.62E-04	27.57
Fuel Truck	-	-	diesel	404	-	-	12	1,218	4.55E-03	0.03	0.02	5.26E-04	4.84E-04	4.59E-05	-	13.71	2.02E-03	8.08E-05	13.79
Electrical																			
Boom Truck	2270003010	150	diesel	201	12	21%	16	5,805	0.05	0.31	0.16	0.03	0.03	2.67E-04	1.16E-02	87.58	2.72E-03	2.23E-03	88.31
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	16	7,771	1.59E-03	0.17	1.20E-02	2.16E-03	2.10E-03	3.09E-04	3.83E-04	117.24	1.16E-04	2.99E-03	118.13
Man Lift Bucket	2270003010	150	diesel	201	12	21%	16	5,805	0.05	0.31	0.16	0.03	0.03	2.67E-04	1.16E-02	87.58	2.72E-03	2.23E-03	88.31
Trencher	2270002030	200	diesel	219	12	59%	16	18,656	0.03	0.38	0.12	0.02	0.02	7.91E-04	7.84E-03	281.45	2.19E-03	7.17E-03	283.64
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	16	13,995	5.43E-03	0.12	0.03	7.55E-03	7.33E-03	5.62E-04	1.31E-03	211.14	4.41E-04	5.38E-03	212.75
Winch Truck	2270002051	250	diesel	211	12	59%	24	34,989	1.00E-02	0.12	0.02	4.67E-03	4.53E-03	1.39E-03	2.41E-03	527.85	4.22E-04	1.34E-02	531.87
Transportation Trucks - materials	-	-	diesel	401	-	-	64	10,647	1.35E-02	0.30	0.15	5.29E-03	4.87E-03	4.02E-04	-	119.83	1.48E-03	1.38E-04	119.91
Substation																			
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	20	17,494	6.79E-03	0.14	0.04	9.44E-03	9.16E-03	7.02E-04	1.64E-03	263.92	5.52E-04	6.72E-03	265.94
Bulldozer	2270002069	200	diesel	207	12	59%	20	23,325	1.13E-02	0.13	0.04	8.96E-03	8.69E-03	9.40E-04	2.71E-03	351.89	7.09E-04	8.96E-03	354.58
Concrete Trucks	2270002042	150	diesel	204	12	43%	40	25,168	0.31	3.56	0.92	0.19	0.18	1.40E-03	0.07	379.70	0.02	9.67E-03	382.99
Drill Rig	2270002033	100	diesel	203	12	43%	20	8,390	0.10	1.14	0.29	0.07	0.06	4.63E-04	0.02	126.58	5.67E-03	3.22E-03	127.68
Man Lift Bucket	2270003010	150	diesel	201	12	21%	20	7,256	0.06	0.39	0.20	0.04	0.04	3.34E-04	1.44E-02	109.47	3.40E-03	2.79E-03	110.39
Trencher	2270002030	200	diesel	219	12	59%	20	23,320	0.04	0.48	0.15	0.03	0.03	9.89E-04	9.81E-03	351.81	2.73E-03	8.96E-03	354.55
Winch Truck	2270002051	250	diesel	211	12	59%	10	14,579	4.18E-03	0.05	9.67E-03	1.95E-03	1.89E-03	5.80E-04	1.01E-03	219.94	1.76E-04	5.60E-03	221.61
Cranes	2270002045	200	diesel	206	12	43%	20	16,815	0.02	0.18	0.04	8.45E-03	8.19E-03	6.91E-04	3.65E-03	253.68	1.05E-03	6.46E-03	255.63
Forklifts	2270003020	75	diesel	209	12	59%	20	9,714	1.98E-03	0.21	0.02	2.70E-03	2.62E-03	3.86E-04	4.79E-04	146.55	1.45E-04	3.73E-03	147.67
Skid Steer Loaders	2270002072	150	diesel	216	12	21%	10	3,617	0.09	0.48	0.29	0.06	0.05	2.01E-04	0.02	54.56	4.73E-03	1.39E-03	55.09
Dump Truck (Side or belly dump)	-	-	diesel	402	-	-	40	7,016	1.34E-02	0.24	0.11	6.02E-03	5.54E-03	2.66E-04	-	78.96	1.75E-03	1.74E-04	79.06
Wind Turbine Assembly & Erection																			
Man Lift Bucket	2270003010	150	diesel	201	12	21%	56	20,318	0.17	1.10	0.57	0.11	0.11	9.34E-04	0.04	306.53	9.53E-03	7.81E-03	309.09
Forklift	2270003020	75	diesel	209	12	59%	28	13,600	2.78E-03	0.30	0.02	3.79E-03	3.67E-03	5.41E-04	6.71E-04	205.17	2.04E-04	5.22E-03	206.73
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	70	58,853	0.05	0.64	0.15	0.03	0.03	2.42E-03	1.28E-02	887.87	3.66E-03	0.02	894.70
Track mounted cranes	2270002045	200	diesel	206	12	43%	18	15,134	1.37E-02	0.16	0.04	7.60E-03	7.37E-03	6.22E-04	3.29E-03	228.31	9.41E-04	5.81E-03	230.07
Transportation Trucks - materials &	-	-	diesel	401	-	-	336	55,898	7.10E-02	1.59	0.78	0.03	0.03	2.11E-03	-	629.10	7.76E-03	7.25E-04	629.51
Transmission Line																			
Cranes	2270002045	200	diesel	206	8	43%	8	4,484	4.05E-03	0.05	1.14E-02	2.25E-03	2.18E-03	1.84E-04	9.74E-04	67.65	2.79E-04	1.72E-03	68.17
Bucket Trucks	2270003010	150	diesel	201	8	21%	20	4,838	0.04	0.26	0.14	0.03	0.03	2.22E-04	9.63E-03	72.98	2.27E-03	1.86E-03	73.59
Wire Pullers	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Wire Tensioners	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Excavators or Backhoes	2270002036	150	diesel	208	4	59%	18	5,248	2.04E-03	0.04	1.31E-02	2.83E-03	2.75E-03	2.11E-04	4.92E-04	79.18	1.65E-04	2.02E-03	79.78
Forklifts	2270003020	75	diesel	209	4	59%	12	1,943	3.97E-04	0.04	3.01E-03	5.41E-04	5.25E-04	7.73E-05	9.59E-05	29.31	2.91E-05	7.46E-04	29.53
Truck / track diggers	2270002036	150	diesel	208	6	59%	4	1,749	6.79E-04	1.45E-02	4.35E-03	9.44E-04	9.16E-04	7.02E-05	1.64E-04	26.39	5.52E-05	6.72E-04	26.59
Dozers	2270002069	200	diesel	207	4	59%	5	1,944	9.39E-04	1.12E-02	3.64E-03	7.47E-04	7.24E-04	7.83E-05	2.26E-04	29.32	5.91E-05	7.47E-04	29.55
UTVs	2270001060	75	diesel	217	2	21%	6	201	2.68E-03	0.02	1.32E-02	1.79E-03	1.74E-03	9.71E-06	6.44E-04	3.04	1.07E-04	7.73E-05	3.06
Tractor	2270002066	150	diesel	218	6	21%	4	725	1.13E-02	0.06	0.04	7.33E-03	7.11E-03	3.68E-05	2.72E-03	10.93	7.19E-04	2.78E-04	11.03
Skid Steer Loaders	2270002072	150	diesel	216	6	21%	12	2,170	0.05	0.29	0.18	0.03	0.03	1.20E-04	1.32E-02	32.74	2.84E-03	8.34E-04	33.06
Underground boring equipment	2270002033	100	diesel	203	8	43%	12	3,356	0.04	0.45	0.12	0.03	0.03	1.85E-04	9.55E-03	50.63	2.27E-03	1.29E-03	51.07
Tractor Trailers	-	-	diesel	401	-	-	6	998	1.27E-03	0.03	1.39E-02	4.96E-04	4.56E-04	3.76E-05	-	11.23	1.39E-04	1.30E-05	11.24
Fuel Trucks / Trailers	-	-	diesel	404	-	-	6	609	2.27E-03	1.29E-02	8.23E-03	2.63E-04	2.42E-04	2.30E-05	-	6.86	1.01E-03	4.04E-05	6.89
O&M Building																			
Excavators or Backhoes	2270002036	150	diesel	208	10	59%	12	8,747	3.39E-03	0.07	0.02	4.72E-03	4.58E-03	3.51E-04	8.20E-04	131.96	2.76E-04	3.36E-03	132.97
Forklifts	2270003020	75	diesel	209	10	59%	8	3,238	6.61E-04	0.07	5.01E-03	9.01E-04	8.74E-04	1.29E-04	1.60E-04	48.85	4.85E-05	1.24E-03	49.22
Skid Steer Loaders	2270002072	150	diesel	216	10	21%	16	4,822	0.12	0.64	0.39	0.07	0.07	2.67E-04	0.03	72.75	6.31E-03	1.85E-03	73.46
Air compressor	2270006015	50	diesel	202	10	43%	4	779	2.14E-03	0.06	1.04E-02	1.32E-03	1.28E-03	3.34E-05	5.14E-04	11.75	2.47E-04	2.99E-04	11.84
Project Cleanup																			
Front end loader	2270002060	150	diesel	215	12	59%	10	8,746	7.39E-03	0.10	0.04	8.58E-03	8.33E-03	3.58E-04	1.78E-03	131.95	5.85E-04	3.36E-03	132.97
Motor grader	2270002048	100	diesel	210	12	59%	10	5,831	3.19E-03	0.06	0.02	4.94E-03	4.79E-03	2.36E-04	7.70E-04	87.97	2.64E-04	2.24E-03	88.65
Dump Truck	-	-	diesel	402	-	-	10	1,754	3.34E-03	0.06	0.03	1.50E-03	1.38E-03	6.66E-05	-	19.74	4.37E-04	4.35E-05	19.76
Transportation Trucks - material/waste	-	-	diesel	401	-	-	15	2,495	3.17E-03	0.07	0.03	1.24E-03	1.14E-03	9.41E-05	-	28.08	3.47E-04	3.24E-05	28.10
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	405	-	-	2,100	127,250	0.61	3.87	4.19	0.14	0.13	4.84E-03	-	1432.12	0.11	7.32E-03	1437.07
Worker Commute																			
Light Commercial Truck	-	-	diesel	405	-	-	1,626	98,528	0.47	2.99	3.25	0.11	0.10	3.75E-03	-	1108.87	0.09	5.66E-03	1112.71
Passenger Car	-	-	gasoline	406	-	-	1,084	35,602	0.33	0.19	4.98	8.60E-03	7.61E-03	2.66E-03	-	400.68	0.03	6.17E-03	403.24
							Total	**1,015,521**	**4.27**	**36.73**	**22.69**	**2.04**	**1.96**	**0.04**	**0.64**	**13,857.79**	**0.41**	**0.27**	**13,947.13**

Notes:
1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2003.
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm - Construction Emissions
Operations and Maintenance

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$PM_{2.5}$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Solar Panel Cleaning																			
Water Truck	-	-	diesel	404	-	-	24	2,436	9.09E-03	0.05	0.03	1.05E-03	9.68E-04	9.19E-05	-	27.42	4.05E-03	1.62E-04	27.57
Worker Commute																			
Light Commercial Truck	-	-	diesel	405	-	-	115	6,968	0.03	0.21	0.23	7.76E-03	7.14E-03	2.65E-04	-	78.43	6.07E-03	4.01E-04	78.70
Passenger Car	-	-	gasoline	406	-	-	77	2,529	0.02	0.01	0.35	6.11E-04	5.40E-04	1.89E-04	-	28.46	2.04E-03	4.38E-04	28.64
							Total	**11,934**	**0.07**	**0.28**	**0.62**	**9.43E-03**	**8.65E-03**	**5.46E-04**	**0.00**	**134.31**	**1.22E-02**	**1.00E-03**	**134.91**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., 21 days/month.
3. Calculations conservatively assume that onroad vehicles travel approximately 50 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately 40 miles per day, since emission factors from the MOVES2014 model for onroad vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. Onroad vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. Onroad vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

2023 Factors for Land-based Nonroad Engines and Other Equipment (Benton County, WA)

	NONROAD Source Category			NONROAD Emission Factors (g/hp-hr) /a								Climate Leaders (g/kWh) /b		NONROAD
	SCC	Description	Engine Size (hp)	Exhaust+ Crankcase VOC	Exhaust NO_x	Exhaust CO	Exhaust PM_{10}	Exhaust $PM_{2.5}$	Exhaust SO_2	Exhaust CO_2	Exhaust CH_4	Exhaust N_2O	Fuel Consumption gal/kWh /c	Default Load Factor
101	2270003010	Aerial Lifts	100 < hp <= 175	0.376424	2.443597	1.276235	0.254440	0.246807	0.001927	625.5	0.020662	0.016	0.061	21%
102	2270006015	Air Compressors	50 < hp <= 75	0.119871	2.895070	0.596171	0.078496	0.076141	0.001705	590.0	0.013032	0.015	0.058	43%
103	2270002033	Bore/Drill Rigs	100 < hp <= 175	0.427554	4.897321	1.265764	0.283498	0.274993	0.001948	529.8	0.023823	0.013	0.052	43%
104	2270002042	Cement & Mortar Mixers	100 < hp <= 175	0.436188	5.030485	1.299992	0.266438	0.258445	0.001948	529.8	0.022694	0.013	0.052	43%
105	2270002042	Cement & Mortar Mixers	175 < hp <= 300	0.385082	4.731720	1.157440	0.216126	0.209642	0.001949	529.9	0.019336	0.013	0.052	43%
106	2270002045	Cranes	175 < hp <= 300	0.041190	0.501905	0.115081	0.022971	0.022281	0.001463	530.9	0.002864	0.014	0.052	43%
107	2270002069	Crawler Tractor/Dozers	175 < hp <= 300	0.021693	0.261679	0.093740	0.019313	0.018733	0.001446	536.8	0.001491	0.014	0.053	59%
108	2270002036	Excavators	100 < hp <= 175	0.017780	0.362621	0.116397	0.026855	0.026049	0.001439	536.8	0.001495	0.014	0.053	59%
109	2270003020	Forklifts	75 < hp <= 100	0.009126	0.877277	0.080988	0.014059	0.013638	0.001574	596.1	0.000691	0.015	0.058	59%
110	2270002048	Graders	100 < hp <= 175	0.027585	0.453197	0.184198	0.045672	0.044302	0.001464	536.8	0.002341	0.014	0.053	59%
111	2270002051	Off-highway Trucks	175 < hp <= 300	0.010901	0.128754	0.027887	0.005615	0.005447	0.001417	536.8	0.000494	0.014	0.053	59%
112	2270002081	Other Construction Equipment	50 < hp <= 75	0.139477	2.984215	0.921432	0.109816	0.106521	0.001689	595.8	0.012876	0.015	0.058	59%
113	2270002081	Other Construction Equipment	100 < hp <= 175	0.079433	0.920534	0.324906	0.069897	0.067800	0.001522	536.6	0.005693	0.014	0.053	59%
114	2270002015	Rollers	75 < hp <= 100	0.047096	1.233691	0.449010	0.057364	0.055643	0.001633	596.0	0.003470	0.015	0.058	59%
115	2270002060	Rubber Tire Loaders	100 < hp <= 175	0.039552	0.494267	0.194670	0.042373	0.041102	0.001470	536.7	0.003130	0.014	0.053	59%
116	2270002072	Skid Steer Loaders	100 < hp <= 175	1.058915	5.532446	3.396834	0.638169	0.619024	0.002293	623.5	0.052753	0.016	0.061	21%
117	2270001060	Specialty Vehicle Carts	50 < hp <= 75	0.669291	4.141205	3.279180	0.450044	0.436543	0.002247	694.1	0.025095	0.018	0.068	21%
118	2270002066	Tractors/Loaders/Backhoes	100 < hp <= 175	0.746563	4.152040	2.356593	0.476468	0.462175	0.002172	624.4	0.047102	0.016	0.061	21%
119	2270002030	Trenchers	175 < hp <= 300	0.074220	0.875665	0.280526	0.056045	0.054363	0.001530	536.6	0.004972	0.014	0.053	59%

/a Emission factors for the land-based nonroad engines were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.

/b Emission factors for N_2O are based on Table B-8 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016. (0.26 g N2O/gal fuel)

/c Fuel consumption for each type of equipment was estimated based on CO2 emission factor (g/hp-hr) generated from the MOVES2014b model and the emission factor for the mass of CO2 generated per gallon of fuel (10.21 kg CO_2/gal fuel) as presented in Table A-1 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016.

2024 Factors for Land-based Nonroad Engines and Other Equipment (Benton County, WA)

				NONROAD Emission Factors (g/hp-hr) /a								Climate Leaders (g/kWh) /b		NONROAD
	NONROAD Source Category			Exhaust+ Crankcase	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Fuel Consumption	Default
	SCC	Description	Engine Size (hp)	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2	CH_4	N_2O	gal/kWh /c	Load Factor
201	2270003010	Aerial Lifts	100 < hp <= 175	0.343116	2.244312	1.168366	0.232684	0.225704	0.001907	625.6	0.019457	0.016	0.061	21%
202	2270006015	Air Compressors	50 < hp <= 75	0.107269	2.833988	0.524802	0.066519	0.064523	0.001676	590.1	0.012384	0.015	0.058	43%
203	2270002033	Bore/Drill Rigs	100 < hp <= 175	0.415637	4.758356	1.220811	0.276390	0.268098	0.001938	529.9	0.023742	0.013	0.052	43%
204	2270002042	Cement & Mortar Mixers	100 < hp <= 175	0.431877	4.960604	1.278622	0.262782	0.254898	0.001948	529.8	0.023260	0.013	0.052	43%
205	2270002042	Cement & Mortar Mixers	175 < hp <= 300	0.380258	4.656690	1.136865	0.211408	0.205065	0.001949	530.0	0.019791	0.013	0.052	43%
206	2270002045	Cranes	175 < hp <= 300	0.031792	0.383332	0.089851	0.017676	0.017146	0.001446	531.0	0.002188	0.014	0.052	43%
207	2270002069	Crawler Tractor/Dozers	175 < hp <= 300	0.017180	0.205727	0.066568	0.013666	0.013256	0.001434	536.8	0.001081	0.014	0.053	59%
208	2270002036	Excavators	100 < hp <= 175	0.013805	0.294341	0.088521	0.019202	0.018626	0.001428	536.8	0.001122	0.014	0.053	59%
209	2270003020	Forklifts	75 < hp <= 100	0.008068	0.863434	0.061159	0.011000	0.010670	0.001571	596.1	0.000591	0.015	0.058	59%
210	2270002048	Graders	100 < hp <= 175	0.019442	0.340177	0.127815	0.030156	0.029251	0.001443	536.8	0.001608	0.014	0.053	59%
211	2270002051	Off-highway Trucks	175 < hp <= 300	0.010204	0.120191	0.023612	0.004752	0.004610	0.001415	536.8	0.000429	0.014	0.053	59%
212	2270002081	Other Construction Equipment	50 < hp <= 75	0.122516	2.900716	0.785789	0.091306	0.088567	0.001667	595.8	0.012211	0.015	0.058	59%
213	2270002081	Other Construction Equipment	100 < hp <= 175	0.066363	0.777606	0.274295	0.058201	0.056455	0.001502	536.6	0.004835	0.014	0.053	59%
214	2270002015	Rollers	75 < hp <= 100	0.034643	1.131882	0.347647	0.045550	0.044183	0.001616	596.1	0.002685	0.015	0.058	59%
215	2270002060	Rubber Tire Loaders	100 < hp <= 175	0.030069	0.397966	0.158162	0.034918	0.033870	0.001456	536.7	0.002379	0.014	0.053	59%
216	2270002072	Skid Steer Loaders	100 < hp <= 175	1.044565	5.461095	3.340533	0.631123	0.612190	0.002293	623.6	0.054061	0.016	0.061	21%
217	2270001060	Specialty Vehicle Carts	50 < hp <= 75	0.612170	3.999074	3.017768	0.410255	0.397947	0.002220	694.2	0.024358	0.018	0.068	21%
218	2270002066	Tractors/Loaders/Backhoes	100 < hp <= 175	0.645219	3.609054	2.049890	0.418799	0.406235	0.002105	624.7	0.041111	0.016	0.061	21%
219	2270002030	Trenchers	175 < hp <= 300	0.062155	0.730293	0.232913	0.046190	0.044804	0.001509	536.7	0.004169	0.014	0.053	59%

/a Emission factors for the land-based nonroad engines were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.

/b Emission factors for N_2O are based on Table B-8 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016. (0.26 g N2O/gal fuel)

/c Fuel consumption for each type of equipment was estimated based on CO2 emission factor (g/hp-hr) generated from the MOVES2014b model and the emission factor for the mass of CO2 generated per gallon of fuel (10.21 kg CO_2/gal fuel) as presented in Table A-1 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016.

Horse Heaven Wind Farm
Emission Factors

2023 Factor for On-road Vehicles (Benton County, WA)

		MOVES2014b Emission factors in grams/VMT /a										
		VOC	NO_x	CO	PM_{10}	PM2.5	SO_2	CO_2	CH_4	N_2O	CO_2e	mi/gal
301	Diesel Combination Long-haul Truck	0.19708	4.36280	2.06888	0.08199	0.07543	0.00554	1653.0	0.02078	0.00187	1654.0	6.18
302	Diesel Refuse Truck	0.32863	5.72492	2.40662	0.15755	0.14494	0.00584	1729.2	0.03852	0.00376	1731.2	5.90
303	Diesel Single Unit Long-haul Truck	0.12184	1.62455	1.06090	0.03698	0.03402	0.00310	926.1	0.02096	0.00313	927.6	11.02
304	Diesel Single Unit Short-haul Truck	0.34450	1.98908	1.22486	0.04459	0.04102	0.00337	1005.3	0.14599	0.00583	1010.7	10.16
305	Diesel Light Commercial Truck	0.28924	1.80128	1.98747	0.06054	0.05570	0.00206	607.4	0.04553	0.00301	608.6	16.81
306	Gasoline Passenger Car	0.27542	0.17850	4.10694	0.00691	0.00611	0.00217	327.2	0.02458	0.00515	329.1	31.20

/a Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2023 using the default input files for calendar year 2023 from the State of Washington Department of Ecology.

2024 Factor for On-road Vehicles (Benton County, WA)

		MOVES2014b Emission factors in grams/VMT /a										
		VOC	NO_x	CO	PM_{10}	PM2.5	SO_2	CO_2	CH_4	N_2O	CO_2e	mi/gal
401	Diesel Combination Long-haul Truck	0.18245	4.08130	2.00034	0.07144	0.06572	0.00542	1617.7	0.01996	0.00187	1618.7	6.31
402	Diesel Refuse Truck	0.28885	5.26539	2.30820	0.13000	0.11960	0.00575	1705.6	0.03780	0.00376	1707.6	5.99
403	Diesel Single Unit Long-haul Truck	0.11464	1.55932	1.04570	0.03728	0.03430	0.00305	909.8	0.02010	0.00313	911.2	11.22
404	Diesel Single Unit Short-haul Truck	0.32730	1.85878	1.18535	0.03787	0.03484	0.00331	987.2	0.14565	0.00582	992.5	10.34
405	Diesel Light Commercial Truck	0.25216	1.59025	1.72447	0.05833	0.05367	0.00199	589.2	0.04557	0.00301	590.4	17.33
406	Gasoline Passenger Car	0.26095	0.14939	3.96998	0.00685	0.00606	0.00212	319.4	0.02291	0.00492	321.2	31.97

/a Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2024 using the default input files for calendar year 2024 from the State of Washington Department of Ecology.

Horse Heaven Wind Farm
MOVES Emission Factors

Benton County, WA												
Input Year	Fuel	Vehicle Type	Emission Factor grams/VMT									
			VOC	NOx	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CO2e
2023	Diesel	Combination Long-haul Truck	0.19708	4.36280	2.06888	0.08199	0.07543	0.00554	1653.0	0.02078	0.00187	1654.0
		Combination Short-haul Truck	0.20423	4.06897	1.91375	0.07046	0.06483	0.00552	1650.4	0.03287	0.00291	1652.1
		Single Unit Long-haul Truck	0.12184	1.62455	1.06090	0.03698	0.03402	0.00310	926.1	0.02096	0.00313	927.6
		Single Unit Short-haul Truck	0.34450	1.98908	1.22486	0.04459	0.04102	0.00337	1005.3	0.14599	0.00583	1010.7
		Refuse Truck	0.32863	5.72492	2.40662	0.15755	0.14494	0.00584	1729.2	0.03852	0.00376	1731.2
		Light Commercial Truck	0.28924	1.80128	1.98747	0.06054	0.05570	0.00206	607.4	0.04553	0.00301	608.6
		Passenger Car	0.19987	0.10901	4.07464	0.00257	0.00237	0.00114	340.9	0.00394	0.00068	341.2
	Gasoline	Combination Short-haul Truck	9.23402	7.44913	135.8309	0.07234	0.06400	0.01038	1563.0	0.33299	0.03792	1582.5
		Single Unit Long-haul Truck	0.76947	0.38745	7.97404	0.01577	0.01395	0.00674	1014.4	0.02776	0.00928	1017.8
		Single Unit Short-haul Truck	1.12743	0.66741	11.18899	0.03934	0.03480	0.00717	1079.0	0.06638	0.04681	1093.0
		Refuse Truck	3.28673	4.48433	39.12965	0.18280	0.16171	0.00784	1180.6	0.17743	0.07946	1208.7
		Light Commercial Truck	0.28364	0.31128	5.17191	0.01102	0.00975	0.00298	448.9	0.03101	0.00922	452.2
		Passenger Car	0.27542	0.17850	4.10694	0.00691	0.00611	0.00217	327.2	0.02458	0.00515	329.1

Note: Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2023 using the de
input files for Benton County from the State of Washington Department of Ecology.

Benton County, WA												
Input Year	Fuel	Vehicle Type	Emission Factor grams/VMT									
			VOC	NOx	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CO2e
2024	Diesel	Combination Long-haul Truck	0.18245	4.08130	2.00034	0.07144	0.06572	0.00542	1617.7	0.01996	0.00187	1618.7
		Combination Short-haul Truck	0.19133	3.85586	1.85778	0.06245	0.05746	0.00541	1616.8	0.03167	0.00291	1618.4
		Single Unit Long-haul Truck	0.11464	1.55932	1.04570	0.03728	0.03430	0.00305	909.8	0.02010	0.00313	911.2
		Single Unit Short-haul Truck	0.32730	1.85878	1.18535	0.03787	0.03484	0.00331	987.2	0.14565	0.00582	992.5
		Refuse Truck	0.28885	5.26539	2.30820	0.13000	0.11960	0.00575	1705.6	0.03780	0.00376	1707.6
		Light Commercial Truck	0.25216	1.59025	1.72447	0.05833	0.05367	0.00199	589.2	0.04557	0.00301	590.4
		Passenger Car	0.19368	0.09464	3.90412	0.00255	0.00235	0.00110	329.4	0.00323	0.00068	329.6
	Gasoline	Combination Short-haul Truck	7.57169	6.25666	112.9196	0.06689	0.05917	0.01057	1590.7	0.28324	0.03486	1608.1
		Single Unit Long-haul Truck	0.70314	0.32138	7.51225	0.01459	0.01291	0.00669	1007.1	0.02535	0.00864	1010.3
		Single Unit Short-haul Truck	1.08079	0.60565	10.67867	0.03860	0.03415	0.00712	1071.7	0.06378	0.04355	1084.8
		Refuse Truck	3.54956	4.40078	38.29389	0.18183	0.16085	0.00789	1187.7	0.17365	0.07850	1215.3
		Light Commercial Truck	0.27141	0.27620	4.88040	0.01095	0.00968	0.00293	440.5	0.02907	0.00876	443.6
		Passenger Car	0.26095	0.14939	3.96998	0.00685	0.00606	0.00212	319.4	0.02291	0.00492	321.2

Note: Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2024 using the de
input files for Benton County from the State of Washington Department of Ecology.

HORSE HEAVEN WIND FARM
EPA NEI HAP Emission Factors for Nonroad Diesels

HAP emission factors for nonroad diesels (below) were obtained from ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2003 (available from http://www.epa.gov/ttn/chief/net/1999inventory.html#final3haps), Appendix D, Tables D-1 through D-3. This is the reference cited by EPA's National Inventory Model (NMIM), i.e., US EPA, "EPA's National Inventory Model (NMIM), A Consolidated Emissions Modeling System for MOBILE6 and NONROAD", EPA420-R-05-024, December 2005 (available from http://www.epa.gov/otaq/models/nmim/420r05024.pdf), pp. 19-21.

Pollutant	Fraction of	Emissions Factor %
1,3-butadiene	VOC - Exhaust	0.0018616
formaldehyde	VOC	0.11815
benzene	VOC	0.020344
acetaldehyde	VOC	0.05308
ethylbenzene	VOC - Exhaust	0.0031001
styrene	VOC - Exhaust	0.00059448
acrolein	VOC	0.00303
toluene	VOC	0.014967
hexane	VOC	0.0015913
propionaldehyde	VOC	0.011815
2,2,4-trimethylpentane	VOC	0.000719235
2,3,7,8-TCDD TEQ **	tons TEQ/gal	1.90705E-14
xylenes	VOC	0.010582
	Total HAP (ratioed to VOC)	**0.239834715**
PAH		
benz[a]anthracene	PM10	0.0000071
benzo[a]pyrene	PM10	0.00000035
benzo[b]fluoranthene	PM10	0.00000049
benzo[k]fluoranthene	PM10	0.00000035
chrysene	PM10	0.0000019
dibenzo[a,h]anthracene	PM10	2.9E-09
indeno[1,2,3-c,d]pyrene	PM10	0.000000079
acenaphthene	PM10	0.0001
acenaphthylene	PM10	0.000084
anthracene	PM10	0.00000043
benzo[g,h,i]perylene	PM10	0.00000019
fluoranthene	PM10	0.000017
fluorene	PM10	0.0001
naphthalene	PM10	0.00046
phenanthrene	PM10	0.00026
pyrene	PM10	0.0000029
	Total HAP (ratioed to PM10)	**0.001034792**
chromium	ug/bhp-hr	0.03
manganese	ug/bhp-hr	1.37
nickel	ug/bhp-hr	2.035
	Total HAP (Metals ug/bhp-hr)	**3.435**

** Note: the emission rate for 2,3,7,8-TCDD TEQ is significantly lower than any other HAP and therefore, was not factored into the total HAP emission factor.

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EFSEC Supplementary Emission Calculations

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Horse Heaven Wind Farm - Construction Emissions Emission Summary by Phase and Calendar Year

Emission Totals by Phase	VOC tons	NO_X tons	CO tons	PM_{10} tons	$^{PM}2.5$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Phase 1 Wind	3.03	24.66	17.83	1.34	1.29	0.03	0.40	9,093.78	0.29	0.17	9,150.72
Phase 1 Solar	2.12	14.67	9.94	1.15	1.11	0.02	0.39	4,794.30	0.16	0.10	4,827.91
Phase 1 Battery	0.27	2.29	1.42	0.12	0.11	2.51E-03	0.03	806.49	0.03	1.37E-02	811.34
Phase 1 total	**5.43**	**41.63**	**29.19**	**2.61**	**2.51**	**0.05**	**0.82**	**14,694.57**	**0.48**	**0.28**	**14,789.97**
Phase 2a Wind	3.47	29.48	18.44	1.68	1.62	0.04	0.53	11,198.93	0.33	0.22	11,272.03
Phase 2a Solar	1.92	13.23	8.75	1.05	1.01	1.43E-02	0.36	4,547.13	0.15	0.10	4,579.36
Phase 2a Battery	0.25	2.12	1.27	0.11	0.11	2.47E-03	0.03	797.29	0.03	1.37E-02	802.14
Phase 2a total	**5.64**	**44.82**	**28.46**	**2.84**	**2.73**	**0.05**	**0.92**	**16,543.35**	**0.51**	**0.33**	**16,653.53**
Phase 2b Wind	4.27	36.73	22.69	2.04	1.96	0.04	0.64	13,857.79	0.41	0.27	13,947.13
Phase 2b total	**4.27**	**36.73**	**22.69**	**2.04**	**1.96**	**0.04**	**0.64**	**13,857.79**	**0.41**	**0.27**	**13,947.13**
O&M	0.07	0.28	0.62	9.43E-03	8.65E-03	5.46E-04	0	134.31	1.22E-02	1.00E-03	134.91
O&M total	**0.07**	**0.28**	**0.62**	**9.43E-03**	**8.65E-03**	**5.46E-04**	**0**	**134.31**	**1.22E-02**	**1.00E-03**	**134.91**

Emission Totals by Calendar Year	VOC tons	NO_X tons	CO tons	PM_{10} tons	$^{PM}2.5$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
2023 (Phase 1)	5.43	41.63	29.19	2.61	2.51	0.05	0.82	14,694.57	0.48	0.28	14,789.97
2024 (Maximum of Phase 2a or 2b)	5.64	44.82	28.46	2.84	2.73	0.05	0.92	16,543.35	0.51	0.33	16,653.53
2025 and onward (O&M)	0.07	0.28	0.62	9.43E-03	8.65E-03	5.46E-04	0	134.31	1.22E-02	1.00E-03	134.91

Construction Distrurbance Area

Project-Related Impacts

Project Component	Units	Dimensions per Unit	Number of Units	Temporary Disturbance Acres[1/]	Units[2/]	Dimensions per Unit[3/]	Number of Units[4/]	Permanent Disturbance Acres	# Construction Scheduled Days: Phase 1	# Construction Scheduled Days: Phase 2a	# Construction Scheduled Days: Phase 2b	Factor to multiply (frequency): Phase 1	Factor to multiply (frequency): Phase 2a	Factor to multiply (frequency): Phase 2b
Wind Turbine Generators	Acres per tower	4.51	244	1,070	Square feet per tower	5,278.0	244	30	198	199	199	0.54	0.55	0.55
Overhead Collector Lines[2/]	Feet of width per linear foot	35	1.8 (mi)	0.5	Square feet per structure	7.1	58	0.01	163	164	164	0.45	0.45	0.45
Underground Collector Lines[2/]	Feet of width per linear foot	30	285.4 (mi)	787	Square feet per structure	25.0	103	0.06	163	164	164	0.45	0.45	0.45
230-kV Transmission Lines	Feet of width per linear foot	100	19.4 (mi)	235	Square feet per structure	4.3	213	0.02	NA	NA	213	NA	NA	0.58
500-kV Transmission Lines	Feet of width per linear foot	200	0.5 (mi)	12	Square feet per structure	4.3	4	<0.01	NA	213	NA	NA	0.58	NA
Meteorological Towers	Acres	1.62	13	21	Square feet per tower	1,764	13	0.5	163	164	164	0.45	0.45	0.45
Meteorological Towers Roads	Feet of width per linear foot	50	2.8 (mi)	17	Feet of width per linear foot	16.0	2.8 (mi)	5	NA	NA	NA	NA	NA	NA
New Access Roads[4/]	Feet of width per linear foot	50	104.5	634	Feet of width per linear foot	16	104.5 (mi)	203	NA	NA	NA	NA	NA	NA
Road Modification (Turning Radius Widening)	Each	--	19	3	Acres	--	--	0	NA	NA	NA	NA	NA	NA
Crane Paths	Feet of width per linear foot	36	33.6 (mi)	147	Feet of width per linear foot	--	--	0	NA	NA	NA	NA	NA	NA
Substations[5/]	Acres	--	5	3	Acres	--	5	38	163	164	164	0.45	0.45	
Battery Storage Facilities	Acres	--	3	1	Acres	--	3	18	120	120	NA	0.33	0.33	NA
Laydown Yards	Acres	--	2	48	Acres	--	--	0	NA	NA	NA	NA	NA	NA
O&M Building	Acres	--	2	0.9	Acres	--	2	10	103	103	103	0.28	0.28	
Solar Array County Well	Acres	--	--	18	Acres	--	--	2,641[6/]	NA	304	NA	NA	0.83	NA
Solar Array Sellards	Acres	--	--	22	Acres	--	--	1,935[6/]	303	304	NA	0.83	0.83	NA
Solar Array East	Acres	--	--	37	Acres	--	--	1,994[6/]	303	NA	NA	0.83	NA	NA
Total Impacts[7/]:	Temporary			2,957	Permanent			6,869						Total

1/ Overlapping permanent disturbance area is subtracted from temporary impact corridors/areas (e.g., temporary impact area around a Turbine does not include the Turbine foundation and graveled area; those are shown only in the permanent impact column).

2/ The collector lines within the solar siting area are not included in this row. Collector lines associated with the Project's solar component are within the fenceline and included in the total permanent disturbance reported for the solar arrays. As the entire area is considered permanently disturbed, no temporary impact is estimated for collector lines within the solar siting area.

3/ See Table 2.3-3 for alternates under consideration for transmission lines. The longest potential transmission line alternative would be construction of the intertie between the alternate HH-West substation and the HH-East substation (19.4 miles). Table 2.3-3 describes other potential combinations of transmission line but none would have greater disturbance area than shown here.

4/ As for collector lines, disturbance from construction of new access roads associated with the Project's solar component is included in the total permanent disturbance reported for the solar siting area. As the entire area within the fenceline is considered permanently disturbed, no temporary impact is estimated for new access roads within the solar siting area.

5/ A total of five Project substation locations are under consideration but no more than four substations would be constructed (see Table 2.3-2). The disturbance area associated with all five locations is shown here as a conservative depiction of potential project impacts.

6/ Permanent Disturbance for Solar Arrays is shown here as disturbance of all areas inside the fence line. However, vegetation would remain within the majority of the solar array except for graveled interior access roads, inverter pad placement, and tracker system support posts,

7/ Totals were calculated using consolidated data, with areas of overlap eliminated. Therefore, totals are not a sum of the Project component rows.

Construction Distrurbance Area

Temporary			Permanent			Total Area (acres)			Total Area (acres) adjusted		
Phase 1	Phase 2a	Phase 2b	Phase 1	Phase 2a	Phase 2b	Phase 1	Phase 2a	Phase 2b	Phase 1	Phase 2a	Phase 2b
340	244	486	10	7	14	350	251	499	189.7	136.9	272.2
0.167	0.167	0.167	0.003	0.003	0.003	0	0	0	0.1	0.1	0.1
262.33	262.33	262.33	0.02	0.02	0.02	262	262	262	117.2	117.9	117.9
NA	NA	235	NA	NA	0.02	NA	NA	235	NA	NA	137.1
NA	12	NA	NA	0.01	NA	NA	12	NA	NA	7.0	NA
10.5	10.5	10.5	0.25	0.25	0.25	11	11	11	4.8	4.8	4.8
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0.6	1.8	0.6	7.6	22.8	7.6	8	25	8	3.7	11.1	0.0
0.3333333	0.666666667	no battery storage facilities	6	12	no battery storage facilities	6	13	NA	2.1	4.2	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0.45	0.45	0.45	5	5	5	5	5	5	1.5	1.5	0.0
NA	18	NA	NA	NA	NA	NA	18	NA	NA	NA	NA
11	11	NA	NA	NA	NA	11	11	NA	9.1	NA	NA
37	NA	NA	NA	NA	NA	37	NA	NA	30.7	NA	NA
663	561	995	28	47	27	691	608	1021	359	283	532

Horse Heaven Wind Farm - Construction Emissions
Summary of Construction Schedule by Phase

Proposed Phase 1 Construction Schedule		
Task	**Start**	**Finish**
Road Construction	1/13/2023	5/3/2023
Wind Turbine Foundations	1/27/2023	4/26/2023
Wind Turbine Assembly	5/4/2023	8/21/2023
Wind Plant Commissioning	7/31/2023	10/30/2023
Solar Array Construction	1/1/2023	10/31/2023
Electrical System Installation	2/15/2023	9/1/2023
Battery Energy Storage System	5/4/2023	9/1/2023
Solar Plant Commissioning	9/1/2023	11/30/2023
Electrical System and Substation	2/15/2023	7/28/2023
O&M Building	3/17/2023	6/28/2023
Phase 1 Final Commercial Operation Date	**11/30/2023**	**-**
Proposed Phase 2a Construction Schedule		
Task	**Start**	**Finish**
Road Construction	1/13/2024	5/3/2024
Wind Turbine Foundations	1/27/2024	4/26/2024
Wind Turbine Assembly	5/4/2024	8/21/2024
Wind Plant Commissioning	7/31/2024	10/30/2024
Solar Array Construction	1/1/2024	10/31/2024
Electrical System Installation	2/15/2024	9/1/2024
Battery Energy Storage System	5/4/2024	9/1/2024
Solar Plant Commissioning	9/1/2024	11/30/2024
Electrical System and Substation	2/15/2024	7/28/2024
O&M Facilities	3/17/2024	6/28/2024
Transmission Line Construction	1/1/2024	8/1/2024
Phase 2a Final Commercial Operation Date	**11/30/2024**	**-**
Proposed Phase 2b Construction Schedule		
Task	**Start**	**Finish**
Road Construction	1/13/2024	5/3/2024
Wind Turbine Foundations	1/27/2024	4/26/2024
Electrical System and Substation	2/15/2024	7/28/2024
Wind Turbine Assembly	5/4/2024	8/21/2024
O&M Facilities	3/17/2024	6/28/2024
Transmission Line Construction	1/1/2024	8/1/2024
Plant Commissioning	7/31/2024	10/30/2024
Phase 2b Final Commercial Operation Date	**10/30/2024**	**-**

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 1 Wind (350 MW)

Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	Fuel Use gal	Emissions VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	107	12	59%	24	27,989	0.02	0.21	0.07	0.02	1.47E-02	1.14E-03	4.11E-03	422.26	1.17E-03	1.08E-02	425.49
Excavator / Backhoe	2270002036	150	diesel	108	12	59%	24	20,993	1.05E-02	0.21	0.07	0.02	0.02	8.49E-04	2.53E-03	316.70	8.82E-04	8.06E-03	319.13
Loader / Skid Steer loader	2270002072	150	diesel	116	12	21%	24	8,679	0.22	1.16	0.71	0.13	0.13	4.81E-04	0.05	130.94	1.11E-02	3.33E-03	132.21
Motor grader	2270002048	100	diesel	110	12	59%	24	13,994	1.09E-02	0.18	0.07	0.02	0.02	5.76E-04	2.62E-03	211.12	9.21E-04	5.38E-03	212.75
Vibratory Roller	2270002015	75	diesel	114	12	59%	18	8,741	1.04E-02	0.27	0.10	1.27E-02	1.23E-02	3.61E-04	2.51E-03	131.87	7.68E-04	3.36E-03	132.89
Dump / Belly Truck	-	-	diesel	302	-	-	72	12,804	0.03	0.48	0.20	1.31E-02	1.21E-02	4.87E-04	-	144.10	3.21E-03	3.13E-04	144.27
Water Truck	-	-	diesel	304	-	-	48	4,963	0.02	0.11	0.07	2.48E-03	2.28E-03	1.87E-04	-	55.85	8.11E-03	3.24E-04	56.15
Fuel Truck	-	-	diesel	304	-	-	12	1,241	4.78E-03	0.03	0.02	6.19E-04	5.70E-04	4.68E-05	-	13.96	2.03E-03	8.09E-05	14.04
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	106	12	43%	12	10,089	1.18E-02	0.14	0.03	6.58E-03	6.39E-03	4.19E-04	2.84E-03	152.20	8.21E-04	3.88E-03	153.37
Concrete pump truck	2270002042	200	diesel	105	12	43%	8	6,713	0.07	0.90	0.22	0.04	0.04	3.72E-04	0.02	101.28	3.70E-03	2.58E-03	102.14
Concrete Truck	2270002042	150	diesel	104	12	43%	64	40,268	0.50	5.77	1.49	0.31	0.30	2.23E-03	0.12	607.50	0.03	0.02	612.76
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	16	13,995	6.99E-03	0.14	0.05	1.06E-02	1.02E-02	5.66E-04	1.69E-03	211.13	5.88E-04	5.38E-03	212.75
Forklifts	2270003020	75	diesel	109	12	59%	12	5,828	1.35E-03	0.13	1.19E-02	2.07E-03	2.01E-03	2.32E-04	3.25E-04	87.93	1.02E-04	2.24E-03	88.60
Skid Steer loader	2270002072	150	diesel	116	12	21%	8	2,893	0.07	0.39	0.24	0.04	0.04	1.60E-04	0.02	43.65	3.69E-03	1.11E-03	44.07
Dump Truck	-	-	diesel	302	-	-	24	4,268	9.13E-03	0.16	0.07	4.38E-03	4.03E-03	1.62E-04	-	48.03	1.07E-03	1.04E-04	48.09
Transportation Trucks - materials	-	-	diesel	301	-	-	24	4,080	5.47E-03	0.12	0.06	2.28E-03	2.10E-03	1.54E-04	-	45.92	5.77E-04	5.18E-05	45.95
Water Truck	-	-	diesel	304	-	-	12	1,241	4.78E-03	0.03	0.02	6.19E-04	5.70E-04	4.68E-05	-	13.96	2.03E-03	8.09E-05	14.04
Fuel Truck	-	-	diesel	304	-	-	8	827	3.19E-03	0.02	1.13E-02	4.13E-04	3.80E-04	3.12E-05	-	9.31	1.35E-03	5.39E-05	9.36
Electrical																			
Boom Truck	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Fork Truck for Spool Offload	2270003020	75	diesel	109	12	59%	12	5,828	1.35E-03	0.13	1.19E-02	2.07E-03	2.01E-03	2.32E-04	3.25E-04	87.93	1.02E-04	2.24E-03	88.60
Man Lift Bucket	2270003010	150	diesel	101	12	21%	12	4,353	0.04	0.26	0.13	0.03	0.03	2.02E-04	9.51E-03	65.67	2.17E-03	1.67E-03	66.23
Trencher	2270002030	200	diesel	119	12	59%	12	13,991	0.03	0.34	0.11	0.02	0.02	6.02E-04	7.03E-03	211.07	1.96E-03	5.37E-03	212.72
Excavators / Backhoes	2270002036	150	diesel	108	12	59%	12	10,496	5.24E-03	0.11	0.03	7.92E-03	7.68E-03	4.24E-04	1.27E-03	158.35	4.41E-04	4.03E-03	159.56
Winch Truck	2270002051	250	diesel	111	12	59%	18	26,242	8.04E-03	0.09	0.02	4.14E-03	4.02E-03	1.05E-03	1.94E-03	395.89	3.64E-04	1.01E-02	398.90
Transportation Trucks - materials	-	-	diesel	301	-	-	32	5,440	7.30E-03	0.16	0.08	3.04E-03	2.79E-03	2.05E-04	-	61.22	7.70E-04	6.91E-05	61.26
Substation																			
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	8	6,998	3.50E-03	0.07	0.02	5.28E-03	5.12E-03	2.83E-04	8.45E-04	105.57	2.94E-04	2.69E-03	106.38
Bulldozer	2270002069	200	diesel	107	12	59%	8	9,330	5.69E-03	0.07	0.02	5.06E-03	4.91E-03	3.79E-04	1.37E-03	140.75	3.91E-04	3.58E-03	141.83
Concrete Trucks	2270002042	150	diesel	104	12	43%	16	10,067	0.13	1.44	0.37	0.08	0.07	5.58E-04	0.03	151.87	6.51E-03	3.87E-03	153.19
Drill Rig	2270002033	100	diesel	103	12	43%	8	3,356	0.04	0.47	0.12	0.03	0.03	1.86E-04	9.83E-03	50.63	2.28E-03	1.29E-03	51.07
Man Lift Bucket	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Trencher	2270002030	200	diesel	119	12	59%	8	9,327	0.02	0.23	0.07	1.47E-02	1.43E-02	4.01E-04	4.68E-03	140.71	1.30E-03	3.58E-03	141.81
Winch Truck	2270002051	250	diesel	111	12	59%	4	5,831	1.79E-03	0.02	4.57E-03	9.20E-04	8.93E-04	2.32E-04	4.30E-04	87.98	8.10E-05	2.24E-03	88.65
Cranes	2270002045	200	diesel	106	12	43%	8	6,726	7.87E-03	0.10	0.02	4.39E-03	4.26E-03	2.80E-04	1.89E-03	101.47	5.47E-04	2.58E-03	102.25
Forklifts	2270003020	75	diesel	109	12	59%	8	3,886	8.97E-04	0.09	7.96E-03	1.38E-03	1.34E-03	1.55E-04	2.17E-04	58.62	6.80E-05	1.49E-03	59.07
Skid Steer Loaders	2270002072	150	diesel	116	12	21%	4	1,447	0.04	0.19	0.12	0.02	0.02	8.02E-05	8.91E-03	21.82	1.85E-03	5.56E-04	22.03
Dump Truck (Side or belly dump)	-	-	diesel	302	-	-	16	2,845	6.09E-03	0.11	0.04	2.92E-03	2.68E-03	1.08E-04	-	32.02	7.13E-04	6.96E-05	32.06
Wind Turbine Assembly & Erection																			
Man Lift Bucket	2270003010	150	diesel	101	12	21%	40	14,511	0.13	0.86	0.45	0.09	0.09	6.74E-04	0.03	218.91	7.23E-03	5.57E-03	220.76
Forklift	2270003020	75	diesel	109	12	59%	20	9,714	0.00	0.22	0.02	3.46E-03	3.35E-03	3.87E-04	5.42E-04	146.55	1.70E-04	3.73E-03	147.67
Rough Terrain Cranes	2270002045	200	diesel	106	12	43%	50	42,036	0.05	0.60	0.14	0.03	0.03	1.75E-03	0.01	634.16	3.42E-03	0.02	639.06
Track mounted cranes	2270002045	200	diesel	106	12	43%	12	10,089	0.01	0.14	0.03	6.58E-03	6.39E-03	4.19E-04	2.84E-03	152.20	8.21E-04	3.88E-03	153.37
equip	-	-	diesel	301	-	-	252	42,838	5.75E-02	1.27	0.60	2.39E-02	0.02	1.62E-03	-	482.12	6.06E-03	5.44E-04	482.43
O&M Building																			
Excavators or Backhoes	2270002036	150	diesel	108	10	59%	12	8,747	4.37E-03	0.09	0.03	6.60E-03	6.40E-03	3.54E-04	1.06E-03	131.96	3.67E-04	3.36E-03	132.97
Forklifts	2270003020	75	diesel	109	10	59%	8	3,238	7.48E-04	0.07	6.64E-03	1.15E-03	1.12E-03	1.29E-04	1.81E-04	48.85	5.66E-05	1.24E-03	49.22
Skid Steer Loaders	2270002072	150	diesel	116	10	21%	16	4,822	0.12	0.65	0.40	0.07	0.07	2.67E-04	0.03	72.74	6.15E-03	1.85E-03	73.45
Air compressor	2270006015	50	diesel	102	10	43%	4	779	2.39E-03	0.06	1.19E-02	1.56E-03	1.52E-03	3.40E-05	5.74E-04	11.75	2.59E-04	2.99E-04	11.84
Project Cleanup																			
Front end loader	2270002060	150	diesel	115	12	59%	8	6,997	7.78E-03	0.10	0.04	8.33E-03	8.08E-03	2.89E-04	1.87E-03	105.55	6.16E-04	2.69E-03	106.37
Motor grader	2270002048	100	diesel	110	12	59%	8	4,665	3.62E-03	0.06	0.02	5.99E-03	5.81E-03	1.92E-04	8.74E-04	70.37	3.07E-04	1.79E-03	70.92
Dump Truck	-	-	diesel	302	-	-	8	1,423	3.04E-03	0.05	0.02	1.46E-03	1.34E-03	5.41E-05	-	16.01	3.57E-04	3.48E-05	16.03
Transportation Trucks - material/waste	-	-	diesel	301	-	-	12	2,040	2.74E-03	0.06	0.03	1.14E-03	1.05E-03	7.70E-05	-	22.96	2.89E-04	2.59E-05	22.97
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and otherdelivery trucks, etc. daily	-	-	diesel	305	-	-	1,080	67,465	0.36	2.25	2.48	0.08	0.07	2.57E-03	-	759.27	0.06	3.76E-03	761.82
Worker Commute																			
Light Commercial Truck	-	-	diesel	305	-	-	1,584	98,948	0.53	3.30	3.64	0.11	0.10	3.77E-03	-	1113.60	0.08	5.52E-03	1117.33
Passenger Car	-	-	gasoline	306	-	-	1,056	35,535	0.34	0.22	5.02	8.44E-03	7.47E-03	2.66E-03	-	399.92	0.03	6.30E-03	402.55
							Total	**675,415**	**3.03**	**24.66**	**17.83**	**1.34**	**1.29**	**0.03**	**0.40**	**9,093.78**	**0.29**	**0.17**	**9,150.72**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2023.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 1 Solar (300 MW)

Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	Fuel Use gal	Emissions VOC tons	NO_x tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	107	12	59%	20	23,325	1.42E-02	0.17	0.06	1.27E-02	1.23E-02	9.48E-04	3.43E-03	351.88	9.77E-04	8.96E-03	354.58
Excavator / Backhoe	2270002036	150	diesel	108	12	59%	20	17,494	8.74E-03	0.18	0.06	1.32E-02	1.28E-02	7.07E-04	2.11E-03	263.92	7.35E-04	6.72E-03	265.94
Loader / Skid Steer loader	2270002072	150	diesel	116	12	21%	20	7,233	0.19	0.97	0.59	0.11	0.11	4.01E-04	0.04	109.11	9.23E-03	2.78E-03	110.17
Motor grader	2270002048	100	diesel	110	12	59%	20	11,662	9.04E-03	0.15	0.06	1.50E-02	0.01	4.80E-04	2.19E-03	175.94	7.67E-04	4.48E-03	177.29
Vibratory Roller	2270002015	75	diesel	114	12	59%	15	7,284	8.68E-03	0.23	0.08	1.06E-02	1.03E-02	3.01E-04	2.09E-03	109.89	6.40E-04	2.80E-03	110.74
Dump / Belly Truck	-	-	diesel	302	-	-	60	10,670	0.02	0.40	0.17	1.09E-02	1.01E-02	4.06E-04	-	120.08	2.67E-03	2.61E-04	120.23
Water Truck	-	-	diesel	304	-	-	40	4,136	0.02	0.09	0.06	2.06E-03	1.90E-03	1.56E-04	-	46.54	6.76E-03	2.70E-04	46.79
Fuel Truck	-	-	diesel	304	-	-	10	1,034	3.99E-03	0.02	0.01	5.16E-04	4.75E-04	3.90E-05	-	11.64	1.69E-03	6.74E-05	11.70
Pile Driving (Solar)																			
Telehandler	2270003010	150	diesel	101	12	21%	15	5,442	0.05	0.32	0.17	0.03	0.03	2.53E-04	1.19E-02	82.09	2.71E-03	2.09E-03	82.78
PD10 Pile Driver	2270002081	50	diesel	112	12	59%	25	8,090	0.03	0.61	0.19	0.02	0.02	3.46E-04	6.88E-03	122.05	2.64E-03	3.11E-03	123.04
Tracked Skidsteer	2270002072	150	diesel	116	12	21%	10	3,616	0.09	0.48	0.30	0.06	0.05	2.01E-04	0.02	54.56	4.62E-03	1.39E-03	55.09
Loader Tractor	2270002066	150	diesel	118	12	21%	5	1,811	0.03	0.18	0.10	0.02	0.02	9.50E-05	7.86E-03	27.32	2.06E-03	6.96E-04	27.58
Fuel Truck	-	-	diesel	304	12	-	5	517	1.99E-03	1.15E-02	7.09E-03	2.58E-04	2.37E-04	1.95E-05	-	5.82	8.45E-04	3.37E-05	5.85
Electrical																			
Dozer	2270002069	200	diesel	107	12	59%	4	4,665	2.84E-03	0.03	1.23E-02	2.53E-03	2.46E-03	1.90E-04	6.85E-04	70.38	1.95E-04	1.79E-03	70.92
Tracked Skidsteer	2270002072	150	diesel	116	12	21%	20	7,233	0.19	0.97	0.59	0.11	0.11	4.01E-04	0.04	109.11	9.23E-03	2.78E-03	110.17
Roller	2270002015	75	diesel	114	12	59%	8	3,885	4.63E-03	0.12	0.04	5.64E-03	5.47E-03	1.61E-04	1.12E-03	58.61	3.41E-04	1.49E-03	59.06
Towable Air Compressor	2270006015	50	diesel	102	12	43%	4	934	2.86E-03	0.07	1.42E-02	1.88E-03	1.82E-03	4.07E-05	6.89E-04	14.09	3.11E-04	3.59E-04	14.21
Motor Grader	2270002048	100	diesel	110	12	59%	4	2,332	1.81E-03	0.03	1.21E-02	2.99E-03	2.90E-03	9.60E-05	4.37E-04	35.19	1.53E-04	8.96E-04	35.46
Trench Padder	2270002072	175	diesel	116	12	21%	4	1,688	0.04	0.23	0.14	0.03	0.03	9.36E-05	1.04E-02	25.46	2.15E-03	6.48E-04	25.71
Utility Tractor	2270002066	150	diesel	118	12	21%	4	1,449	0.03	0.15	0.08	0.02	0.02	7.60E-05	6.28E-03	21.85	1.65E-03	5.57E-04	22.06
Telehandler	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Boom Truck	2270003010	150	diesel	101	12	21%	12	4,353	0.04	0.26	0.13	0.03	0.03	2.02E-04	9.51E-03	65.67	2.17E-03	1.67E-03	66.23
Fork Truck for Spool Offload	2270003020	75	diesel	109	12	59%	8	3,886	8.97E-04	0.09	7.96E-03	1.38E-03	1.34E-03	1.55E-04	2.17E-04	58.62	6.80E-05	1.49E-03	59.07
Man Lift Bucket	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Trencher	2270002030	200	diesel	119	12	59%	8	9,327	0.02	0.23	0.07	1.47E-02	0.01	4.01E-04	4.68E-03	140.71	1.30E-03	3.58E-03	141.81
Excavators / Backhoes	2270002036	150	diesel	108	12	59%	8	6,998	3.50E-03	0.07	0.02	5.28E-03	5.12E-03	2.83E-04	8.45E-04	105.57	2.94E-04	2.69E-03	106.38
Winch Truck	2270002051	250	diesel	111	12	59%	8	11,663	3.57E-03	0.04	9.14E-03	1.84E-03	1.79E-03	4.65E-04	8.60E-04	175.95	1.62E-04	4.48E-03	177.29
Water Truck	-	-	diesel	304	-		4	414	1.59E-03	9.21E-03	5.67E-03	2.06E-04	1.90E-04	1.56E-05	-	4.65	6.76E-04	2.70E-05	4.68
Transportation Trucks - materials	-	-	diesel	301	-	-	32	5,440	7.30E-03	0.16	0.08	3.04E-03	2.79E-03	2.05E-04	-	61.22	7.70E-04	6.91E-05	61.26
Substation																			
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	8	6,998	3.50E-03	0.07	0.02	5.28E-03	5.12E-03	2.83E-04	8.45E-04	105.57	2.94E-04	2.69E-03	106.38
Bulldozer	2270002069	200	diesel	107	12	59%	8	9,330	5.69E-03	0.07	0.02	5.06E-03	4.91E-03	3.79E-04	1.37E-03	140.75	3.91E-04	3.58E-03	141.83
Concrete Trucks	2270002042	150	diesel	104	12	43%	16	10,067	0.13	1.44	0.37	0.08	0.07	5.58E-04	0.03	151.87	6.51E-03	3.87E-03	153.19
Drill Rig	2270002033	100	diesel	103	12	43%	8	3,356	0.04	0.47	0.12	0.03	0.03	1.86E-04	9.83E-03	50.63	2.28E-03	1.29E-03	51.07
Man Lift Bucket	2270003010	150	diesel	101	12	21%	8	2,902	0.03	0.17	0.09	0.02	0.02	1.35E-04	6.34E-03	43.78	1.45E-03	1.11E-03	44.15
Trencher	2270002030	200	diesel	119	12	59%	8	9,327	0.02	0.23	0.07	1.47E-02	1.43E-02	4.01E-04	4.68E-03	140.71	1.30E-03	3.58E-03	141.81
Winch Truck	2270002051	250	diesel	111	12	59%	4	5,831	1.79E-03	0.02	4.57E-03	9.20E-04	8.93E-04	2.32E-04	4.30E-04	87.98	8.10E-05	2.24E-03	88.65
Cranes	2270002045	200	diesel	106	12	43%	8	6,726	7.87E-03	0.10	0.02	4.39E-03	4.26E-03	2.80E-04	1.89E-03	101.47	5.47E-04	2.58E-03	102.25
Forklifts	2270003020	75	diesel	109	12	59%	8	3,886	8.97E-04	0.09	7.96E-03	1.38E-03	1.34E-03	1.55E-04	2.17E-04	58.62	6.80E-05	1.49E-03	59.07
Skid Steer Loaders	2270002072	150	diesel	116	12	21%	4	1,447	0.04	0.19	0.12	0.02	0.02	8.02E-05	8.91E-03	21.82	1.85E-03	5.56E-04	22.03
Dump Truck (Side or belly dump)	-	-	diesel	302	-	-	16	2,845	6.09E-03	0.11	0.04	2.92E-03	2.68E-03	1.08E-04	-	32.02	7.13E-04	6.96E-05	32.06
Solar Panel Installation																			
Tracked Skidsteer	2270002072	175	diesel	116	12	21%	25	10,548	0.27	1.41	0.87	0.16	0.16	5.85E-04	0.06	159.12	1.35E-02	4.05E-03	160.67
Loader	2270002060	150	diesel	115	12	59%	5	4,373	4.86E-03	0.06	0.02	5.21E-03	5.05E-03	1.81E-04	1.17E-03	65.97	3.85E-04	1.68E-03	66.48
Telehandler	2270003010	150	diesel	101	12	21%	15	5,442	0.05	0.32	0.17	0.03	0.03	2.53E-04	1.19E-02	82.09	2.71E-03	2.09E-03	82.78
Project Cleanup																			
Telehandler	2270003010	150	diesel	101	12	21%	10	3,628	0.03	0.21	0.11	0.02	0.02	1.69E-04	7.92E-03	54.73	1.81E-03	1.39E-03	55.19
Tracked Skidsteer	2270002072	150	diesel	116	12	21%	20	7,233	0.19	0.97	0.59	0.11	0.11	4.01E-04	0.04	109.11	9.23E-03	2.78E-03	110.17
Transportation Trucks - material/waste	-	-	diesel	301	-	-	9	1,530	2.05E-03	0.05	0.02	8.54E-04	7.86E-04	5.78E-05	-	17.22	2.16E-04	1.94E-05	17.23
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, andother delivery trucks, etc. daily	-	-	diesel	305	-	-	900	56,221	0.30	1.88	2.07	0.06	0.06	2.14E-03	-	632.73	0.05	3.14E-03	634.85
Buggies	-	-	gasoline	306	-	-	384	12,922	0.12	0.08	1.83	3.07E-03	2.72E-03	9.66E-04	-	145.43	1.09E-02	2.29E-03	146.38
Busses	-	-	diesel	303	-	-	72	6,857	0.01	0.14	0.09	3.08E-03	2.84E-03	2.59E-04	-	77.17	1.75E-03	2.61E-04	77.30
							Total	**343,847**	**2.12**	**14.67**	**9.94**	**1.15**	**1.11**	**0.02**	**0.39**	**4,794.30**	**0.16**	**0.10**	**4,827.91**

Notes:
1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e. days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2023.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 1 Battery (150 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$^{PM}2.5$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	107	12	59%	4	4,665	2.84E-03	0.03	1.23E-02	2.53E-03	2.46E-03	1.90E-04	6.85E-04	70.38	1.95E-04	1.79E-03	70.92
Excavator / Backhoe	2270002036	150	diesel	108	12	59%	4	3,499	1.75E-03	0.04	1.14E-02	2.64E-03	2.56E-03	1.41E-04	4.22E-04	52.78	1.47E-04	1.34E-03	53.19
Loader / Skid Steer loader	2270002072	150	diesel	116	12	21%	2	723	0.02	0.10	0.06	1.12E-02	1.08E-02	4.01E-05	4.46E-03	10.91	9.23E-04	2.78E-04	11.02
Motor grader	2270002048	100	diesel	110	12	59%	2	1,166	9.04E-04	1.49E-02	6.04E-03	1.50E-03	1.45E-03	4.80E-05	2.19E-04	17.59	7.67E-05	4.48E-04	17.73
Vibratory Roller	2270002015	75	diesel	114	12	59%	2	971	1.16E-03	0.03	1.10E-02	1.41E-03	1.37E-03	4.01E-05	2.79E-04	14.65	8.53E-05	3.73E-04	14.77
Dump / Belly Truck	-	-	diesel	302	-	-	4	711	1.52E-03	0.03	1.11E-02	7.29E-04	6.71E-04	2.71E-05	-	8.01	1.78E-04	1.74E-05	8.02
Water Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Fuel Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	106	12	43%	2	1,681	1.97E-03	0.02	5.50E-03	1.10E-03	1.06E-03	6.99E-05	4.73E-04	25.37	1.37E-04	6.46E-04	25.56
Concrete Truck	2270002042	150	diesel	104	12	43%	8	5,034	0.06	0.72	0.19	0.04	0.04	2.79E-04	0.02	75.94	3.25E-03	1.93E-03	76.59
Backhoe or Excavator	2270002036	150	diesel	108	12	59%	4	3,499	1.75E-03	0.04	1.14E-02	2.64E-03	2.56E-03	1.41E-04	4.22E-04	52.78	1.47E-04	1.34E-03	53.19
Forklifts	2270003020	75	diesel	109	12	59%	4	1,943	4.49E-04	0.04	3.98E-03	6.91E-04	6.71E-04	7.74E-05	1.08E-04	29.31	3.40E-05	7.46E-04	29.53
Skid Steer loader	2270002072	150	diesel	116	12	21%	2	723	0.02	0.10	0.06	1.12E-02	1.08E-02	4.01E-05	4.46E-03	10.91	9.23E-04	2.78E-04	11.02
Dump Truck	-	-	diesel	302	-	-	4	711	1.52E-03	0.03	1.11E-02	7.29E-04	6.71E-04	2.71E-05	-	8.01	1.78E-04	1.74E-05	8.02
Transportation Trucks - materials	-	-	diesel	301	-	-	4	680	9.12E-04	0.02	9.58E-03	3.80E-04	3.49E-04	2.57E-05	-	7.65	9.62E-05	8.63E-06	7.66
Water Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Fuel Truck	-	-	diesel	304	-	-	2	207	7.97E-04	4.60E-03	2.84E-03	1.03E-04	9.50E-05	7.80E-06	-	2.33	3.38E-04	1.35E-05	2.34
Electrical																			
Boom Truck	2270003010	150	diesel	101	12	21%	2	726	6.59E-03	0.04	0.02	4.45E-03	4.32E-03	3.37E-05	1.58E-03	10.95	3.62E-04	2.79E-04	11.04
Fork Truck for Spool Offload	2270003020	75	diesel	109	12	59%	2	971	2.24E-04	0.02	1.99E-03	3.46E-04	3.35E-04	3.87E-05	5.42E-05	14.65	1.70E-05	3.73E-04	14.77
Man Lift Bucket	2270003010	150	diesel	101	12	21%	2	726	6.59E-03	0.04	0.02	4.45E-03	4.32E-03	3.37E-05	1.58E-03	10.95	3.62E-04	2.79E-04	11.04
Trencher	2270002030	200	diesel	119	12	59%	2	2,332	4.87E-03	0.06	0.02	3.67E-03	3.56E-03	1.00E-04	1.17E-03	35.18	3.26E-04	8.96E-04	35.45
Excavators / Backhoes	2270002036	150	diesel	108	12	59%	2	1,749	8.74E-04	0.02	5.72E-03	1.32E-03	1.28E-03	7.07E-05	2.11E-04	26.39	7.35E-05	6.72E-04	26.59
Transportation Trucks - materials	-	-	diesel	301	-	-	4	680	9.12E-04	0.02	9.58E-03	3.80E-04	3.49E-04	2.57E-05	-	7.65	9.62E-05	8.63E-06	7.66
Project Cleanup																			
Front end loader	2270002060	150	diesel	115	12	59%	1	875	9.72E-04	1.22E-02	4.79E-03	1.04E-03	1.01E-03	3.61E-05	2.34E-04	13.19	7.69E-05	3.36E-04	13.30
Motor grader	2270002048	100	diesel	110	12	59%	1	583	4.52E-04	7.43E-03	3.02E-03	7.49E-04	7.26E-04	2.40E-05	1.09E-04	8.80	3.84E-05	2.24E-04	8.86
Dump Truck	-	-	diesel	302	-	-	1	178	3.80E-04	6.63E-03	2.79E-03	1.82E-04	1.68E-04	6.76E-06	-	2.00	4.46E-05	4.35E-06	2.00
Transportation Trucks - material/waste	-	-	diesel	301	-	-	1	170	2.28E-04	5.05E-03	2.39E-03	9.49E-05	8.73E-05	6.42E-06	-	1.91	2.41E-05	2.16E-06	1.91
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and otherdelivery trucks, etc. daily	-	-	diesel	305	-	-	400	24,987	0.13	0.83	0.92	0.03	0.03	9.53E-04	-	281.21	0.02	1.39E-03	282.16
							Total	**60,810**	**0.27**	**2.29**	**1.42**	**0.12**	**0.11**	**2.51E-03**	**0.03**	**806.49**	**0.03**	**1.37E-02**	**811.34**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7,
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2023.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 2a Wind (250 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$PM_{2.5}$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	32	37,320	0.02	0.22	0.07	1.43E-02	1.39E-02	1.50E-03	4.34E-03	563.02	1.13E-03	1.43E-02	567.33
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	32	27,991	1.09E-02	0.23	0.07	0.02	1.47E-02	1.12E-03	2.62E-03	422.28	8.82E-04	1.08E-02	425.50
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	32	11,573	0.29	1.53	0.94	0.18	0.17	6.42E-04	0.07	174.59	0.02	4.45E-03	176.30
Motor grader	2270002048	100	diesel	210	12	59%	32	18,660	1.02E-02	0.18	0.07	0.02	0.02	7.57E-04	2.46E-03	281.51	8.44E-04	7.17E-03	283.67
Vibratory Roller	2270002015	75	diesel	214	12	59%	24	11,655	1.02E-02	0.33	0.10	1.34E-02	1.30E-02	4.77E-04	2.47E-03	175.84	7.92E-04	4.48E-03	177.19
Dump / Belly Truck	-	-	diesel	402	-	-	96	16,839	0.03	0.59	0.26	1.44E-02	1.33E-02	6.39E-04	-	189.51	4.20E-03	4.17E-04	189.74
Water Truck	-	-	diesel	404	-	-	64	6,497	0.02	0.14	0.09	2.81E-03	2.58E-03	2.45E-04	-	73.12	1.08E-02	4.31E-04	73.52
Fuel Truck	-	-	diesel	404	-	-	16	1,624	6.06E-03	0.03	0.02	7.01E-04	6.45E-04	6.12E-05	-	18.28	2.70E-03	1.08E-04	18.38
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	12	10,089	9.11E-03	0.11	0.03	5.07E-03	4.92E-03	4.14E-04	2.19E-03	152.21	6.27E-04	3.88E-03	153.38
Concrete pump truck	2270002042	200	diesel	205	12	43%	8	6,713	0.07	0.89	0.22	0.04	0.04	3.72E-04	0.02	101.28	3.78E-03	2.58E-03	102.14
Concrete Truck	2270002042	150	diesel	204	12	43%	64	40,269	0.50	5.69	1.47	0.30	0.29	2.23E-03	0.12	607.51	0.03	0.02	612.79
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	16	13,995	5.43E-03	0.12	0.03	7.55E-03	7.33E-03	5.62E-04	1.31E-03	211.14	4.41E-04	5.38E-03	212.75
Forklifts	2270003020	75	diesel	209	12	59%	12	5,828	1.19E-03	0.13	9.02E-03	1.62E-03	1.57E-03	2.32E-04	2.88E-04	87.93	8.72E-05	2.24E-03	88.60
Skid Steer loader	2270002072	150	diesel	216	12	21%	8	2,893	0.07	0.38	0.23	0.04	0.04	1.60E-04	0.02	43.65	3.78E-03	1.11E-03	44.07
Dump Truck	-	-	diesel	402	-	-	24	4,210	8.02E-03	0.15	0.06	3.61E-03	3.32E-03	1.60E-04	-	47.38	1.05E-03	1.04E-04	47.43
Transportation Trucks - materials	-	-	diesel	401	-	-	24	3,993	5.07E-03	0.11	0.06	1.98E-03	1.83E-03	1.51E-04	-	44.94	5.54E-04	5.18E-05	44.97
Water Truck	-	-	diesel	404	-	-	12	1,218	4.55E-03	0.03	0.02	5.26E-04	4.84E-04	4.59E-05	-	13.71	2.02E-03	8.08E-05	13.79
Fuel Truck	-	-	diesel	404	-	-	8	812	3.03E-03	0.02	1.10E-02	3.51E-04	3.23E-04	3.06E-05	-	9.14	1.35E-03	5.39E-05	9.19
Electrical																			
Boom Truck	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	12	5,828	1.19E-03	0.13	9.02E-03	1.62E-03	1.57E-03	2.32E-04	2.88E-04	87.93	8.72E-05	2.24E-03	88.60
Man Lift Bucket	2270003010	150	diesel	201	12	21%	12	4,354	0.04	0.24	0.12	0.02	0.02	2.00E-04	8.67E-03	65.68	2.04E-03	1.67E-03	66.23
Trencher	2270002030	200	diesel	219	12	59%	12	13,992	0.02	0.29	0.09	0.02	0.02	5.93E-04	5.88E-03	211.08	1.64E-03	5.38E-03	212.73
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	12	10,497	4.07E-03	0.09	0.03	5.66E-03	5.49E-03	4.21E-04	9.84E-04	158.35	3.31E-04	4.03E-03	159.56
Winch Truck	2270002051	250	diesel	211	12	59%	8	11,663	3.34E-03	0.04	0.01	1.56E-03	1.51E-03	4.64E-04	8.05E-04	175.95	1.41E-04	4.48E-03	177.29
Transportation Trucks - materials	-	-	diesel	401	-	-	32	5,324	6.76E-03	0.15	0.07	2.65E-03	2.43E-03	2.01E-04	-	59.91	7.39E-04	6.91E-05	59.95
Substation																			
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	20	17,494	6.79E-03	0.14	0.04	9.44E-03	9.16E-03	7.02E-04	1.64E-03	263.92	5.52E-04	6.72E-03	265.94
Bulldozer	2270002069	200	diesel	207	12	59%	20	23,325	1.13E-02	0.13	0.04	8.96E-03	8.69E-03	9.40E-04	2.71E-03	351.89	7.09E-04	8.96E-03	354.58
Concrete Trucks	2270002042	150	diesel	204	12	43%	40	25,168	0.31	3.56	0.92	0.19	0.18	1.40E-03	0.07	379.70	0.02	9.67E-03	382.99
Drill Rig	2270002033	100	diesel	203	12	43%	20	8,390	0.10	1.14	0.29	0.07	0.06	4.63E-04	0.02	126.58	5.67E-03	3.22E-03	127.68
Man Lift Bucket	2270003010	150	diesel	201	12	21%	20	7,256	0.06	0.39	0.20	0.04	0.04	3.34E-04	1.44E-02	109.47	3.40E-03	2.79E-03	110.39
Trencher	2270002030	200	diesel	219	12	59%	20	23,320	0.04	0.48	0.15	0.03	0.03	9.89E-04	9.81E-03	351.81	2.73E-03	8.96E-03	354.55
Winch Truck	2270002051	250	diesel	211	12	59%	10	14,579	4.18E-03	0.05	9.67E-03	1.95E-03	1.89E-03	5.80E-04	1.01E-03	219.94	1.76E-04	5.60E-03	221.61
Cranes	2270002045	200	diesel	206	12	43%	20	16,815	0.02	0.18	0.04	8.45E-03	8.19E-03	6.91E-04	3.65E-03	253.68	1.05E-03	6.46E-03	255.63
Forklifts	2270003020	75	diesel	209	12	59%	20	9,714	1.98E-03	0.21	0.02	2.70E-03	2.62E-03	3.86E-04	4.79E-04	146.55	1.45E-04	3.73E-03	147.67
Skid Steer Loaders	2270002072	150	diesel	216	12	21%	10	3,617	0.09	0.48	0.29	0.06	0.05	2.01E-04	0.02	54.56	4.73E-03	1.39E-03	55.09
Dump Truck (Side or belly dump)	-	-	diesel	402	-	-	40	7,016	1.34E-02	0.24	0.11	6.02E-03	5.54E-03	2.66E-04	-	78.96	1.75E-03	1.74E-04	79.06
Wind Turbine Assembly & Erection																			
Man Lift Bucket	2270003010	150	diesel	201	12	21%	40	14,513	0.12	0.79	0.41	0.08	0.08	6.67E-04	0.03	218.95	6.81E-03	5.58E-03	220.78
Forklift	2270003020	75	diesel	209	12	59%	20	9,714	1.98E-03	0.21	0.02	2.70E-03	2.62E-03	3.86E-04	4.79E-04	146.55	1.45E-04	3.73E-03	147.67
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	50	42,038	0.04	0.46	0.11	0.02	0.02	1.73E-03	9.13E-03	634.19	2.61E-03	0.02	639.07
Track mounted cranes	2270002045	200	diesel	206	12	43%	12	10,089	9.11E-03	0.11	0.03	5.07E-03	4.92E-03	4.14E-04	2.19E-03	152.21	6.27E-04	3.88E-03	153.38
rials & equip	-	-	diesel	401	-	-	252	41,924	5.32E-02	1.19	0.58	0.02	0.02	1.58E-03	-	471.83	5.82E-03	5.44E-04	472.13
Transmission Line																			
Cranes	2270002045	200	diesel	206	8	43%	8	4,484	4.05E-03	0.05	1.14E-02	2.25E-03	2.18E-03	1.84E-04	9.74E-04	67.65	2.79E-04	1.72E-03	68.17
Bucket Trucks	2270003010	150	diesel	201	8	21%	20	4,838	0.04	0.26	0.14	0.03	0.03	2.22E-04	9.63E-03	72.98	2.27E-03	1.86E-03	73.59
Wire Pullers	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Wire Tensioners	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Excavators or Backhoes	2270002036	150	diesel	208	4	59%	18	5,248	2.04E-03	0.04	1.31E-02	2.83E-03	2.75E-03	2.11E-04	4.92E-04	79.18	1.65E-04	2.02E-03	79.78
Forklifts	2270003020	75	diesel	209	4	59%	12	1,943	3.97E-04	0.04	3.01E-03	5.41E-04	5.25E-04	7.73E-05	9.59E-05	29.31	2.91E-05	7.46E-04	29.53
Truck / track diggers	2270002036	150	diesel	208	6	59%	4	1,749	6.79E-04	1.45E-02	4.35E-03	9.44E-04	9.16E-04	7.02E-05	1.64E-04	26.39	5.52E-05	6.72E-04	26.59
Dozers	2270002069	200	diesel	207	4	59%	5	1,944	9.39E-04	1.12E-02	3.64E-03	7.47E-04	7.24E-04	7.83E-05	2.26E-04	29.32	5.91E-05	7.47E-04	29.55
UTVs	2270001060	75	diesel	217	2	21%	6	201	2.68E-03	0.02	1.32E-02	1.79E-03	1.74E-03	9.71E-06	6.44E-04	3.04	1.07E-04	7.73E-05	3.06
Tractor	2270002066	150	diesel	218	6	21%	4	725	1.13E-02	0.06	0.04	7.33E-03	7.11E-03	3.68E-05	2.72E-03	10.93	7.19E-04	2.78E-04	11.03
Skid Steer Loaders	2270002072	150	diesel	216	6	21%	12	2,170	0.05	0.29	0.18	0.03	0.03	1.20E-04	1.32E-02	32.74	2.84E-03	8.34E-04	33.06
Underground boring equipment	2270002033	100	diesel	203	8	43%	12	3,356	0.04	0.45	0.12	0.03	0.03	1.85E-04	9.55E-03	50.63	2.27E-03	1.29E-03	51.07
Tractor Trailers	-	-	diesel	401	-	-	6	998	1.27E-03	0.03	1.39E-02	4.96E-04	4.56E-04	3.76E-05	-	11.23	1.39E-04	1.30E-05	11.24
Fuel Trucks / Trailers	-	-	diesel	404	-	-	6	609	2.27E-03	1.29E-02	8.23E-03	2.63E-04	2.42E-04	2.30E-05	-	6.86	1.01E-03	4.04E-05	6.89

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 2a Wind (250 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$^{PM}2.5$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
O&M Building																			
Excavators or Backhoes	2270002036	150	diesel	208	10	59%	12	8,747	3.39E-03	0.07	0.02	4.72E-03	4.58E-03	3.51E-04	8.20E-04	131.96	2.76E-04	3.36E-03	132.97
Forklifts	2270003020	75	diesel	209	10	59%	8	3,238	6.61E-04	0.07	5.01E-03	9.01E-04	8.74E-04	1.29E-04	1.60E-04	48.85	4.85E-05	1.24E-03	49.22
Skid Steer Loaders	2270002072	150	diesel	216	10	21%	16	4,822	0.12	0.64	0.39	0.07	0.07	2.67E-04	0.03	72.75	6.31E-03	1.85E-03	73.46
Air compressor	2270006015	50	diesel	202	10	43%	4	779	2.14E-03	0.06	1.04E-02	1.32E-03	1.28E-03	3.34E-05	5.14E-04	11.75	2.47E-04	2.99E-04	11.84
Project Cleanup																			
Front end loader	2270002060	150	diesel	215	12	59%	8	6,997	5.91E-03	0.08	0.03	6.87E-03	6.66E-03	2.86E-04	1.43E-03	105.56	4.68E-04	2.69E-03	106.37
Motor grader	2270002048	100	diesel	210	12	59%	8	4,665	2.55E-03	0.04	0.02	3.95E-03	3.84E-03	1.89E-04	6.16E-04	70.38	2.11E-04	1.79E-03	70.92
Dump Truck	-	-	diesel	402	-	-	8	1,403	2.67E-03	0.05	0.02	1.20E-03	1.11E-03	5.32E-05	-	15.79	3.50E-04	3.48E-05	15.81
aterial/waste	-	-	diesel	401	-	-	12	1,996	2.53E-03	0.06	0.03	9.92E-04	9.13E-04	7.53E-05	-	22.47	2.77E-04	2.59E-05	22.48
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. daily	-	-	diesel	405	-	-	1,400	84,833	0.41	2.58	2.79	0.09	0.09	3.23E-03	-	954.75	0.07	4.88E-03	958.05
Worker Commute																			
Light Commercial Truck	-	-	diesel	405	-	-	1,412	85,560	0.41	2.60	2.82	0.10	0.09	3.26E-03	-	962.93	0.07	4.92E-03	966.26
Passenger Car	-	-	gasoline	406	-	-	942	30,938	0.28	0.16	4.33	7.47E-03	6.61E-03	2.31E-03	-	348.19	0.02	5.36E-03	350.41
							Total	**817,455**	**3.47**	**29.48**	**18.44**	**1.68**	**1.62**	**0.04**	**0.53**	**11,198.93**	**0.33**	**0.22**	**11,272.03**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 2a Solar (250 MW)

Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	Fuel Use gal	Emissions VOC tons	NO_X tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	16	18,660	9.01E-03	0.11	0.03	7.17E-03	6.95E-03	7.52E-04	2.17E-03	281.51	5.67E-04	7.17E-03	283.66
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	16	13,995	5.43E-03	0.12	0.03	7.55E-03	7.33E-03	5.62E-04	1.31E-03	211.14	4.41E-04	5.38E-03	212.75
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	16	5,787	0.15	0.76	0.47	0.09	0.09	3.21E-04	0.04	87.30	7.57E-03	2.22E-03	88.15
Motor grader	2270002048	100	diesel	210	12	59%	16	9,330	5.10E-03	0.09	0.03	7.91E-03	7.67E-03	3.78E-04	1.23E-03	140.75	4.22E-04	3.58E-03	141.83
Vibratory Roller	2270002015	75	diesel	214	12	59%	12	5,828	5.11E-03	0.17	0.05	6.72E-03	6.52E-03	2.38E-04	1.23E-03	87.92	3.96E-04	2.24E-03	88.60
Dump / Belly Truck	-	-	diesel	402	-	-	48	8,419	0.02	0.29	0.13	7.22E-03	6.64E-03	3.19E-04	-	94.76	2.10E-03	2.09E-04	94.87
Water Truck	-	-	diesel	404	-	-	32	3,249	1.21E-02	0.07	0.04	1.40E-03	1.29E-03	1.22E-04	-	36.56	5.39E-03	2.15E-04	36.76
Fuel Truck	-	-	diesel	404	-	-	8	812	3.03E-03	0.02	1.10E-02	3.51E-04	3.23E-04	3.06E-05	-	9.14	1.35E-03	5.39E-05	9.19
Pile Driving (Solar)																			
Telehandler	2270003010	150	diesel	201	12	21%	15	5,442	0.05	0.29	0.15	0.03	0.03	2.50E-04	1.08E-02	82.11	2.55E-03	2.09E-03	82.79
PD10 Pile Driver	2270002081	50	diesel	212	12	59%	25	8,090	0.03	0.59	0.16	0.02	0.02	3.42E-04	6.04E-03	122.06	2.50E-03	3.11E-03	123.04
Tracked Skidsteer	2270002072	150	diesel	216	12	21%	10	3,617	0.09	0.48	0.29	0.06	0.05	2.01E-04	0.02	54.56	4.73E-03	1.39E-03	55.09
Loader Tractor	2270002066	150	diesel	218	12	21%	5	1,812	0.03	0.16	0.09	0.02	0.02	9.21E-05	6.79E-03	27.33	1.80E-03	6.96E-04	27.58
Fuel Truck	-	-	diesel	404	-	-	5	508	1.89E-03	1.08E-02	6.86E-03	2.19E-04	2.02E-04	1.91E-05	-	5.71	8.43E-04	3.37E-05	5.74
Electrical																			
Dozer	2270002069	200	diesel	207	12	59%	4	4,665	2.25E-03	0.03	8.73E-03	1.79E-03	1.74E-03	1.88E-04	5.43E-04	70.38	1.42E-04	1.79E-03	70.92
Tracked Skidsteer	2270002072	150	diesel	216	12	21%	20	7,233	0.18	0.96	0.58	0.11	0.11	4.01E-04	0.04	109.12	9.46E-03	2.78E-03	110.19
Roller	2270002015	75	diesel	214	12	59%	8	3,885	3.41E-03	0.11	0.03	4.48E-03	4.34E-03	1.59E-04	8.22E-04	58.61	2.64E-04	1.49E-03	59.06
Towable Air Compressor	2270006015	50	diesel	202	12	43%	4	934	2.56E-03	0.07	1.25E-02	1.59E-03	1.54E-03	4.00E-05	6.16E-04	14.10	2.96E-04	3.59E-04	14.21
Motor Grader	2270002048	100	diesel	210	12	59%	4	2,332	1.27E-03	0.02	8.38E-03	1.98E-03	1.92E-03	9.46E-05	3.08E-04	35.19	1.05E-04	8.96E-04	35.46
Trench Padder	2270002072	175	diesel	216	12	21%	4	1,688	0.04	0.22	0.14	0.03	0.02	9.36E-05	1.03E-02	25.46	2.21E-03	6.48E-04	25.71
Utility Tractor	2270002066	150	diesel	218	12	21%	4	1,449	0.02	0.13	0.07	1.47E-02	1.42E-02	7.37E-05	5.43E-03	21.86	1.44E-03	5.57E-04	22.07
Telehandler	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Boom Truck	2270003010	150	diesel	201	12	21%	12	4,354	0.04	0.24	0.12	0.02	0.02	2.00E-04	8.67E-03	65.68	2.04E-03	1.67E-03	66.23
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	8	3,886	7.93E-04	0.08	6.01E-03	1.08E-03	1.05E-03	1.55E-04	1.92E-04	58.62	5.81E-05	1.49E-03	59.07
Man Lift Bucket	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Trencher	2270002030	200	diesel	219	12	59%	8	9,328	0.02	0.19	0.06	1.21E-02	1.17E-02	3.96E-04	3.92E-03	140.72	1.09E-03	3.58E-03	141.82
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	8	6,998	2.72E-03	0.06	0.02	3.78E-03	3.66E-03	2.81E-04	6.56E-04	105.57	2.21E-04	2.69E-03	106.38
Winch Truck	2270002051	250	diesel	211	12	59%	12	17,494	5.02E-03	0.06	1.16E-02	2.34E-03	2.27E-03	6.96E-04	1.21E-03	263.93	2.11E-04	6.72E-03	265.94
Water Truck	-	-	diesel	404	-	-	4	406	1.52E-03	8.61E-03	5.49E-03	1.75E-04	1.61E-04	1.53E-05	-	4.57	6.74E-04	2.69E-05	4.60
Transportation Trucks - materials	-	-	diesel	401	-	-	32	5,324	6.76E-03	0.15	0.07	2.65E-03	2.43E-03	2.01E-04	-	59.91	7.39E-04	6.91E-05	59.95
Substation																			
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	8	6,998	2.72E-03	0.06	0.02	3.78E-03	3.66E-03	2.81E-04	6.56E-04	105.57	2.21E-04	2.69E-03	106.38
Bulldozer	2270002069	200	diesel	207	12	59%	8	9,330	4.50E-03	0.05	0.02	3.58E-03	3.48E-03	3.76E-04	1.09E-03	140.76	2.83E-04	3.58E-03	141.83
Concrete Trucks	2270002042	150	diesel	204	12	43%	16	10,067	0.12	1.42	0.37	0.08	0.07	5.58E-04	0.03	151.88	6.67E-03	3.87E-03	153.20
Drill Rig	2270002033	100	diesel	203	12	43%	8	3,356	0.04	0.45	0.12	0.03	0.03	1.85E-04	9.55E-03	50.63	2.27E-03	1.29E-03	51.07
Man Lift Bucket	2270003010	150	diesel	201	12	21%	8	2,903	0.02	0.16	0.08	0.02	0.02	1.33E-04	5.78E-03	43.79	1.36E-03	1.12E-03	44.16
Trencher	2270002030	200	diesel	219	12	59%	8	9,328	0.02	0.19	0.06	1.21E-02	1.17E-02	3.96E-04	3.92E-03	140.72	1.09E-03	3.58E-03	141.82
Winch Truck	2270002051	250	diesel	211	12	59%	4	5,831	1.67E-03	0.02	3.87E-03	7.79E-04	7.56E-04	2.32E-04	4.02E-04	87.98	7.03E-05	2.24E-03	88.65
Cranes	2270002045	200	diesel	206	12	43%	8	6,726	6.08E-03	0.07	0.02	3.38E-03	3.28E-03	2.76E-04	1.46E-03	101.47	4.18E-04	2.58E-03	102.25
Forklifts	2270003020	75	diesel	209	12	59%	8	3,886	7.93E-04	0.08	6.01E-03	1.08E-03	1.05E-03	1.55E-04	1.92E-04	58.62	5.81E-05	1.49E-03	59.07
Skid Steer Loaders	2270002072	150	diesel	216	12	21%	4	1,447	0.04	0.19	0.12	0.02	0.02	8.02E-05	8.79E-03	21.82	1.89E-03	5.56E-04	22.04
Dump Truck (Side or belly dump)	-	-	diesel	402	-	-	16	2,806	5.35E-03	0.10	0.04	2.41E-03	2.21E-03	1.06E-04	-	31.59	7.00E-04	6.95E-05	31.62
Solar Panel Installation																			
Tracked Skidsteer	2270002072	175	diesel	216	12	21%	25	10,548	0.27	1.39	0.85	0.16	0.16	5.85E-04	0.06	159.14	1.38E-02	4.05E-03	160.69
Loader	2270002060	150	diesel	215	12	59%	5	4,373	3.70E-03	0.05	0.02	4.29E-03	4.16E-03	1.79E-04	8.91E-04	65.98	2.92E-04	1.68E-03	66.48
Telehandler	2270003010	150	diesel	201	12	21%	15	5,442	0.05	0.29	0.15	0.03	0.03	2.50E-04	1.08E-02	82.11	2.55E-03	2.09E-03	82.79
Project Cleanup																			
Telehandler	2270003010	150	diesel	201	12	21%	10	3,628	0.03	0.20	0.10	0.02	0.02	1.67E-04	7.22E-03	54.74	1.70E-03	1.39E-03	55.19
Tracked Skidsteer	2270002072	150	diesel	216	12	21%	20	7,233	0.18	0.96	0.58	0.11	0.11	4.01E-04	0.04	109.12	9.46E-03	2.78E-03	110.19
Transportation Trucks - material/waste	-	-	diesel	401	-	-	9	1,497	1.90E-03	0.04	0.02	7.44E-04	6.85E-04	5.65E-05	-	16.85	2.08E-04	1.94E-05	16.86
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, andother delivery trucks, etc. daily	-	-	diesel	405	-	-	825	49,991	0.24	1.52	1.65	0.06	0.05	1.90E-03	-	562.62	0.04	2.87E-03	564.56
Buggies	-	-	gasoline	406	-	-	352	11,561	0.11	0.06	1.62	2.79E-03	2.47E-03	8.64E-04	-	130.11	9.33E-03	2.00E-03	130.94
Busses	-	-	diesel	403	-	-	66	6,175	8.76E-03	0.12	0.08	2.85E-03	2.62E-03	2.33E-04	-	69.50	1.54E-03	2.39E-04	69.61
							Total	**324,457**	**1.92**	**13.23**	**8.75**	**1.05**	**1.01**	**1.43E-02**	**0.36**	**4,547.13**	**0.15**	**0.10**	**4,579.36**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e. days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 2a Battery (150 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$^{PM}2.5$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	4	4,665	2.25E-03	0.03	8.73E-03	1.79E-03	1.74E-03	1.88E-04	5.43E-04	70.38	1.42E-04	1.79E-03	70.92
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	4	3,499	1.36E-03	0.03	8.70E-03	1.89E-03	1.83E-03	1.40E-04	3.28E-04	52.78	1.10E-04	1.34E-03	53.19
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	2	723	0.02	0.10	0.06	1.10E-02	1.07E-02	4.01E-05	4.40E-03	10.91	9.46E-04	2.78E-04	11.02
Motor grader	2270002048	100	diesel	210	12	59%	2	1,166	6.37E-04	1.12E-02	4.19E-03	9.88E-04	9.59E-04	4.73E-05	1.54E-04	17.59	5.27E-05	4.48E-04	17.73
Vibratory Roller	2270002015	75	diesel	214	12	59%	2	971	8.52E-04	0.03	8.55E-03	1.12E-03	1.09E-03	3.97E-05	2.05E-04	14.65	6.60E-05	3.73E-04	14.77
Dump / Belly Truck	-	-	diesel	402	-	-	4	702	1.34E-03	0.02	1.07E-02	6.02E-04	5.54E-04	2.66E-05	-	7.90	1.75E-04	1.74E-05	7.91
Water Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Fuel Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	2	1,682	1.52E-03	0.02	4.29E-03	8.45E-04	8.19E-04	6.91E-05	3.65E-04	25.37	1.05E-04	6.46E-04	25.56
Concrete Truck	2270002042	150	diesel	204	12	43%	8	5,034	0.06	0.71	0.18	0.04	0.04	2.79E-04	1.49E-02	75.94	3.33E-03	1.93E-03	76.60
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	4	3,499	1.36E-03	0.03	8.70E-03	1.89E-03	1.83E-03	1.40E-04	3.28E-04	52.78	1.10E-04	1.34E-03	53.19
Forklifts	2270003020	75	diesel	209	12	59%	4	1,943	3.97E-04	0.04	3.01E-03	5.41E-04	5.25E-04	7.73E-05	9.59E-05	29.31	2.91E-05	7.46E-04	29.53
Skid Steer loader	2270002072	150	diesel	216	12	21%	2	723	0.02	0.10	0.06	1.10E-02	1.07E-02	4.01E-05	4.40E-03	10.91	9.46E-04	2.78E-04	11.02
Dump Truck	-	-	diesel	402	-	-	4	702	1.34E-03	0.02	1.07E-02	6.02E-04	5.54E-04	2.66E-05	-	7.90	1.75E-04	1.74E-05	7.91
Transportation Trucks - materials	-	-	diesel	401	-	-	4	665	8.45E-04	0.02	9.26E-03	3.31E-04	3.04E-04	2.51E-05	-	7.49	9.24E-05	8.63E-06	7.49
Water Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Fuel Truck	-	-	diesel	404	-	-	2	203	7.58E-04	4.30E-03	2.74E-03	8.77E-05	8.06E-05	7.66E-06	-	2.29	3.37E-04	1.35E-05	2.30
Electrical																			
Boom Truck	2270003010	150	diesel	201	12	21%	2	726	6.00E-03	0.04	0.02	4.07E-03	3.95E-03	3.34E-05	1.44E-03	10.95	3.40E-04	2.79E-04	11.04
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	2	971	1.98E-04	0.02	1.50E-03	2.70E-04	2.62E-04	3.86E-05	4.79E-05	14.66	1.45E-05	3.73E-04	14.77
Man Lift Bucket	2270003010	150	diesel	201	12	21%	2	726	6.00E-03	0.04	0.02	4.07E-03	3.95E-03	3.34E-05	1.44E-03	10.95	3.40E-04	2.79E-04	11.04
Trencher	2270002030	200	diesel	219	12	59%	2	2,332	4.07E-03	0.05	0.02	3.03E-03	2.94E-03	9.89E-05	9.81E-04	35.18	2.73E-04	8.96E-04	35.45
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	2	1,749	6.79E-04	1.45E-02	4.35E-03	9.44E-04	9.16E-04	7.02E-05	1.64E-04	26.39	5.52E-05	6.72E-04	26.59
Transportation Trucks - materials	-	-	diesel	401	-	-	4	665	8.45E-04	0.02	9.26E-03	3.31E-04	3.04E-04	2.51E-05	-	7.49	9.24E-05	8.63E-06	7.49
Project Cleanup																			
Front end loader	2270002060	150	diesel	215	12	59%	1	875	7.39E-04	9.78E-03	3.89E-03	8.58E-04	8.33E-04	3.58E-05	1.78E-04	13.20	5.85E-05	3.36E-04	13.30
Motor grader	2270002048	100	diesel	210	12	59%	1	583	3.19E-04	5.58E-03	2.09E-03	4.94E-04	4.79E-04	2.36E-05	7.70E-05	8.80	2.64E-05	2.24E-04	8.86
Dump Truck	-	-	diesel	402	-	-	1	175	3.34E-04	6.09E-03	2.67E-03	1.50E-04	1.38E-04	6.66E-06	-	1.97	4.37E-05	4.35E-06	1.98
Transportation Trucks - material/waste	-	-	diesel	401	-	-	1	166	2.11E-04	4.72E-03	2.32E-03	8.27E-05	7.61E-05	6.27E-06	-	1.87	2.31E-05	2.16E-06	1.87
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and otherdelivery trucks, etc. daily	-	-	diesel	405	-	-	400	24,238	0.12	0.74	0.80	0.03	0.02	9.23E-04	-	272.79	0.02	1.39E-03	273.73
							Total	**59,993**	**0.25**	**2.12**	**1.27**	**0.11**	**0.11**	**2.47E-03**	**0.03**	**797.29**	**0.03**	**1.37E-02**	**802.14**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7,
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

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Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 2b Wind (500 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$PM_{2.5}$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Site Prep & Road Const																			
Bulldozer	2270002069	200	diesel	207	12	59%	32	37,320	0.02	0.22	0.07	1.43E-02	1.39E-02	1.50E-03	4.34E-03	563.02	1.13E-03	1.43E-02	567.33
Excavator / Backhoe	2270002036	150	diesel	208	12	59%	32	27,991	1.09E-02	0.23	0.07	0.02	1.47E-02	1.12E-03	2.62E-03	422.28	8.82E-04	1.08E-02	425.50
Loader / Skid Steer loader	2270002072	150	diesel	216	12	21%	32	11,573	0.29	1.53	0.94	0.18	0.17	6.42E-04	0.07	174.59	0.02	4.45E-03	176.30
Motor grader	2270002048	100	diesel	210	12	59%	32	18,660	1.02E-02	0.18	0.07	0.02	0.02	7.57E-04	2.46E-03	281.51	8.44E-04	7.17E-03	283.67
Vibratory Roller	2270002015	75	diesel	214	12	59%	24	11,655	1.02E-02	0.33	0.10	1.34E-02	1.30E-02	4.77E-04	2.47E-03	175.84	7.92E-04	4.48E-03	177.19
Dump / Belly Truck	-	-	diesel	402	-	-	96	16,839	0.03	0.59	0.26	1.44E-02	1.33E-02	6.39E-04	-	189.51	4.20E-03	4.17E-04	189.74
Water Truck	-	-	diesel	404	-	-	64	6,497	0.02	0.14	0.09	2.81E-03	2.58E-03	2.45E-04	-	73.12	1.08E-02	4.31E-04	73.52
Fuel Truck	-	-	diesel	404	-	-	16	1,624	6.06E-03	0.03	0.02	7.01E-04	6.45E-04	6.12E-05	-	18.28	2.70E-03	1.08E-04	18.38
Foundation																			
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	18	15,134	1.37E-02	0.16	0.04	7.60E-03	7.37E-03	6.22E-04	3.29E-03	228.31	9.41E-04	5.81E-03	230.07
Concrete pump truck	2270002042	200	diesel	205	12	43%	12	10,070	0.11	1.33	0.33	0.06	0.06	5.59E-04	0.03	151.92	5.67E-03	3.87E-03	153.22
Concrete Truck	2270002042	150	diesel	204	12	43%	96	60,404	0.74	8.53	2.20	0.45	0.44	3.35E-03	0.18	911.27	0.04	0.02	919.19
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	24	20,993	8.15E-03	0.17	0.05	1.13E-02	1.10E-02	8.43E-04	1.97E-03	316.71	6.62E-04	8.07E-03	319.13
Forklifts	2270003020	75	diesel	209	12	59%	18	8,743	1.78E-03	0.19	1.35E-02	2.43E-03	2.36E-03	3.48E-04	4.31E-04	131.90	1.31E-04	3.36E-03	132.90
Skid Steer loader	2270002072	150	diesel	216	12	21%	12	4,340	0.11	0.57	0.35	0.07	0.06	2.41E-04	0.03	65.47	5.68E-03	1.67E-03	66.11
Dump Truck	-	-	diesel	402	-	-	36	6,315	1.20E-02	0.22	0.10	5.42E-03	4.98E-03	2.40E-04	-	71.07	1.57E-03	1.56E-04	71.15
Transportation Trucks - materials	-	-	diesel	401	-	-	36	5,989	7.60E-03	0.17	0.08	2.98E-03	2.74E-03	2.26E-04	-	67.40	8.32E-04	7.77E-05	67.45
Water Truck	-	-	diesel	404	-	-	24	2,436	9.09E-03	0.05	0.03	1.05E-03	9.68E-04	9.19E-05	-	27.42	4.05E-03	1.62E-04	27.57
Fuel Truck	-	-	diesel	404	-	-	12	1,218	4.55E-03	0.03	0.02	5.26E-04	4.84E-04	4.59E-05	-	13.71	2.02E-03	8.08E-05	13.79
Electrical																			
Boom Truck	2270003010	150	diesel	201	12	21%	16	5,805	0.05	0.31	0.16	0.03	0.03	2.67E-04	1.16E-02	87.58	2.72E-03	2.23E-03	88.31
Fork Truck for Spool Offload	2270003020	75	diesel	209	12	59%	16	7,771	1.59E-03	0.17	1.20E-02	2.16E-03	2.10E-03	3.09E-04	3.83E-04	117.24	1.16E-04	2.99E-03	118.13
Man Lift Bucket	2270003010	150	diesel	201	12	21%	16	5,805	0.05	0.31	0.16	0.03	0.03	2.67E-04	1.16E-02	87.58	2.72E-03	2.23E-03	88.31
Trencher	2270002030	200	diesel	219	12	59%	16	18,656	0.03	0.38	0.12	0.02	0.02	7.91E-04	7.84E-03	281.45	2.19E-03	7.17E-03	283.64
Excavators / Backhoes	2270002036	150	diesel	208	12	59%	16	13,995	5.43E-03	0.12	0.03	7.55E-03	7.33E-03	5.62E-04	1.31E-03	211.14	4.41E-04	5.38E-03	212.75
Winch Truck	2270002051	250	diesel	211	12	59%	24	34,989	1.00E-02	0.12	0.02	4.67E-03	4.53E-03	1.39E-03	2.41E-03	527.85	4.22E-04	1.34E-02	531.87
Transportation Trucks - materials	-	-	diesel	401	-	-	64	10,647	1.35E-02	0.30	0.15	5.29E-03	4.87E-03	4.02E-04	-	119.83	1.48E-03	1.38E-04	119.91
Substation																			
Backhoe or Excavator	2270002036	150	diesel	208	12	59%	20	17,494	6.79E-03	0.14	0.04	9.44E-03	9.16E-03	7.02E-04	1.64E-03	263.92	5.52E-04	6.72E-03	265.94
Bulldozer	2270002069	200	diesel	207	12	59%	20	23,325	1.13E-02	0.13	0.04	8.96E-03	8.69E-03	9.40E-04	2.71E-03	351.89	7.09E-04	8.96E-03	354.58
Concrete Trucks	2270002042	150	diesel	204	12	43%	40	25,168	0.31	3.56	0.92	0.19	0.18	1.40E-03	0.07	379.70	0.02	9.67E-03	382.99
Drill Rig	2270002033	100	diesel	203	12	43%	20	8,390	0.10	1.14	0.29	0.07	0.06	4.63E-04	0.02	126.58	5.67E-03	3.22E-03	127.68
Man Lift Bucket	2270003010	150	diesel	201	12	21%	20	7,256	0.06	0.39	0.20	0.04	0.04	3.34E-04	1.44E-02	109.47	3.40E-03	2.79E-03	110.39
Trencher	2270002030	200	diesel	219	12	59%	20	23,320	0.04	0.48	0.15	0.03	0.03	9.89E-04	9.81E-03	351.81	2.73E-03	8.96E-03	354.55
Winch Truck	2270002051	250	diesel	211	12	59%	10	14,579	4.18E-03	0.05	9.67E-03	1.95E-03	1.89E-03	5.80E-04	1.01E-03	219.94	1.76E-04	5.60E-03	221.61
Cranes	2270002045	200	diesel	206	12	43%	20	16,815	0.02	0.18	0.04	8.45E-03	8.19E-03	6.91E-04	3.65E-03	253.68	1.05E-03	6.46E-03	255.63
Forklifts	2270003020	75	diesel	209	12	59%	20	9,714	1.98E-03	0.21	0.02	2.70E-03	2.62E-03	3.86E-04	4.79E-04	146.55	1.45E-04	3.73E-03	147.67
Skid Steer Loaders	2270002072	150	diesel	216	12	21%	10	3,617	0.09	0.48	0.29	0.06	0.05	2.01E-04	0.02	54.56	4.73E-03	1.39E-03	55.09
Dump Truck (Side or belly dump)	-	-	diesel	402	-	-	40	7,016	1.34E-02	0.24	0.11	6.02E-03	5.54E-03	2.66E-04	-	78.96	1.75E-03	1.74E-04	79.06
Wind Turbine Assembly & Erection																			
Man Lift Bucket	2270003010	150	diesel	201	12	21%	56	20,318	0.17	1.10	0.57	0.11	0.11	9.34E-04	0.04	306.53	9.53E-03	7.81E-03	309.09
Forklift	2270003020	75	diesel	209	12	59%	28	13,600	2.78E-03	0.30	0.02	3.79E-03	3.67E-03	5.41E-04	6.71E-04	205.17	2.04E-04	5.22E-03	206.73
Rough Terrain Cranes	2270002045	200	diesel	206	12	43%	70	58,853	0.05	0.64	0.15	0.03	0.03	2.42E-03	1.28E-02	887.87	3.66E-03	0.02	894.70
Track mounted cranes	2270002045	200	diesel	206	12	43%	18	15,134	1.37E-02	0.16	0.04	7.60E-03	7.37E-03	6.22E-04	3.29E-03	228.31	9.41E-04	5.81E-03	230.07
Transportation Trucks - materials &	-	-	diesel	401	-	-	336	55,898	7.10E-02	1.59	0.78	0.03	0.03	2.11E-03	-	629.10	7.76E-03	7.25E-04	629.51
Transmission Line																			
Cranes	2270002045	200	diesel	206	8	43%	8	4,484	4.05E-03	0.05	1.14E-02	2.25E-03	2.18E-03	1.84E-04	9.74E-04	67.65	2.79E-04	1.72E-03	68.17
Bucket Trucks	2270003010	150	diesel	201	8	21%	20	4,838	0.04	0.26	0.14	0.03	0.03	2.22E-04	9.63E-03	72.98	2.27E-03	1.86E-03	73.59
Wire Pullers	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Wire Tensioners	2270002081	100	diesel	213	6	59%	6	1,749	3.26E-03	0.04	1.35E-02	2.86E-03	2.78E-03	7.38E-05	7.86E-04	26.38	2.38E-04	6.72E-04	26.59
Excavators or Backhoes	2270002036	150	diesel	208	4	59%	18	5,248	2.04E-03	0.04	1.31E-02	2.83E-03	2.75E-03	2.11E-04	4.92E-04	79.18	1.65E-04	2.02E-03	79.78
Forklifts	2270003020	75	diesel	209	4	59%	12	1,943	3.97E-04	0.04	3.01E-03	5.41E-04	5.25E-04	7.73E-05	9.59E-05	29.31	2.91E-05	7.46E-04	29.53
Truck / track diggers	2270002036	150	diesel	208	6	59%	4	1,749	6.79E-04	1.45E-02	4.35E-03	9.44E-04	9.16E-04	7.02E-05	1.64E-04	26.39	5.52E-05	6.72E-04	26.59

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Phase 2b Wind (500 MW)

								Fuel Use	Emissions										
Construction Equipment	**Source Category**	**HP per unit**	**Fuel Type**	**Emiss. Factor ID**	**hrs per day**	**Load Factor**	**Total Equip. Months**	**gal**	**VOC tons**	**NO_X tons**	**CO tons**	**PM_{10} tons**	**$PM_{2.5}$ tons**	**SO_2 tons**	**HAP Tons**	**CO_2 tons**	**CH_4 tons**	**N_2O tons**	**CO_2e tons**
Dozers	2270002069	200	diesel	207	4	59%	5	1,944	9.39E-04	1.12E-02	3.64E-03	7.47E-04	7.24E-04	7.83E-05	2.26E-04	29.32	5.91E-05	7.47E-04	29.55
UTVs	2270001060	75	diesel	217	2	21%	6	201	2.68E-03	0.02	1.32E-02	1.79E-03	1.74E-03	9.71E-06	6.44E-04	3.04	1.07E-04	7.73E-05	3.06
Tractor	2270002066	150	diesel	218	6	21%	4	725	1.13E-02	0.06	0.04	7.33E-03	7.11E-03	3.68E-05	2.72E-03	10.93	7.19E-04	2.78E-04	11.03
Skid Steer Loaders	2270002072	150	diesel	216	6	21%	12	2,170	0.05	0.29	0.18	0.03	0.03	1.20E-04	1.32E-02	32.74	2.84E-03	8.34E-04	33.06
Underground boring equipment	2270002033	100	diesel	203	8	43%	12	3,356	0.04	0.45	0.12	0.03	0.03	1.85E-04	9.55E-03	50.63	2.27E-03	1.29E-03	51.07
Tractor Trailers	-	-	diesel	401	-	-	6	998	1.27E-03	0.03	1.39E-02	4.96E-04	4.56E-04	3.76E-05	-	11.23	1.39E-04	1.30E-05	11.24
Fuel Trucks / Trailers	-	-	diesel	404	-	-	6	609	2.27E-03	1.29E-02	8.23E-03	2.63E-04	2.42E-04	2.30E-05	-	6.86	1.01E-03	4.04E-05	6.89
O&M Building																			
Excavators or Backhoes	2270002036	150	diesel	208	10	59%	12	8,747	3.39E-03	0.07	0.02	4.72E-03	4.58E-03	3.51E-04	8.20E-04	131.96	2.76E-04	3.36E-03	132.97
Forklifts	2270003020	75	diesel	209	10	59%	8	3,238	6.61E-04	0.07	5.01E-03	9.01E-04	8.74E-04	1.29E-04	1.60E-04	48.85	4.85E-05	1.24E-03	49.22
Skid Steer Loaders	2270002072	150	diesel	216	10	21%	16	4,822	0.12	0.64	0.39	0.07	0.07	2.67E-04	0.03	72.75	6.31E-03	1.85E-03	73.46
Air compressor	2270006015	50	diesel	202	10	43%	4	779	2.14E-03	0.06	1.04E-02	1.32E-03	1.28E-03	3.34E-05	5.14E-04	11.75	2.47E-04	2.99E-04	11.84
Project Cleanup																			
Front end loader	2270002060	150	diesel	215	12	59%	10	8,746	7.39E-03	0.10	0.04	8.58E-03	8.33E-03	3.58E-04	1.78E-03	131.95	5.85E-04	3.36E-03	132.97
Motor grader	2270002048	100	diesel	210	12	59%	10	5,831	3.19E-03	0.06	0.02	4.94E-03	4.79E-03	2.36E-04	7.70E-04	87.97	2.64E-04	2.24E-03	88.65
Dump Truck	-	-	diesel	402	-	-	10	1,754	3.34E-03	0.06	0.03	1.50E-03	1.38E-03	6.66E-05	-	19.74	4.37E-04	4.35E-05	19.76
Transportation Trucks - material/waste	-	-	diesel	401	-	-	15	2,495	3.17E-03	0.07	0.03	1.24E-03	1.14E-03	9.41E-05	-	28.08	3.47E-04	3.24E-05	28.10
Daily Construction Traffic																			
Full size pickups, FedEx, UPS, and other delivery trucks, etc. da	-	-	diesel	405	-	-	2,100	127,250	0.61	3.87	4.19	0.14	0.13	4.84E-03	-	1432.12	0.11	7.32E-03	1437.07
Worker Commute																			
Light Commercial Truck	-	-	diesel	405	-	-	1,626	98,528	0.47	2.99	3.25	0.11	0.10	3.75E-03	-	1108.87	0.09	5.66E-03	1112.71
Passenger Car	-	-	gasoline	406	-	-	1,084	35,602	0.33	0.19	4.98	8.60E-03	7.61E-03	2.66E-03	-	400.68	0.03	6.17E-03	403.24
							Total	**1,015,521**	**4.27**	**36.73**	**22.69**	**2.04**	**1.96**	**0.04**	**0.64**	**13,857.79**	**0.41**	**0.27**	**13,947.13**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e. days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2003.
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm - Construction Emissions Operations and Maintenance

Construction Equipment	Source Category	HP per unit	Fuel Type	Emiss. Factor ID	hrs per day	Load Factor	Total Equip. Months	Fuel Use gal	Emissions VOC tons	NO_x tons	CO tons	PM_{10} tons	$PM_{2.5}$ tons	SO_2 tons	HAP Tons	CO_2 tons	CH_4 tons	N_2O tons	CO_2e tons
Solar Panel Cleaning																			
Water Truck	-	-	diesel	404	-	-	24	2,436	9.09E-03	0.05	0.03	1.05E-03	9.68E-04	9.19E-05	-	27.42	4.05E-03	1.62E-04	27.57
Worker Commute																			
Light Commercial Truck	-	-	diesel	405	-	-	115	6,968	0.03	0.21	0.23	7.76E-03	7.14E-03	2.65E-04	-	78.43	6.07E-03	4.01E-04	78.70
Passenger Car	-	-	gasoline	406	-	-	77	2,529	0.02	0.01	0.35	6.11E-04	5.40E-04	1.89E-04	-	28.46	2.04E-03	4.38E-04	28.64
							Total	**11,934**	**0.07**	**0.28**	**0.62**	**9.43E-03**	**8.65E-03**	**5.46E-04**	**0.00**	**134.31**	**1.22E-02**	**1.00E-03**	**134.91**

Notes:

1. Equipment assumptions based on information provided by the project.
2. Calculations assume equipment is used 5 days/wk - i.e., days/month.
3. Calculations conservatively assume that on-road vehicles travel approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
4. Calculations conservatively assume workers average daily round trip commute is approximately miles per day, since emission factors from the MOVES2014 model for on-road vehicles are based on miles traveled.
5. Nonroad emission factors for criteria pollutants and GHG were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.
6. Nonroad emission factors for HAPs were estimated using ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7,
7. On-road vehicle emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were estimated using the MOVES2014b emission model for an assumed construction year of 2024.
8. On-road vehicle emission factors for HAP were not provided with the default MOVES input files for Benton County, but are presumed to be de minimis.

Horse Heaven Wind Farm Emission Factors

2023 Factors for Land-based Nonroad Engines and Other Equipment (Benton County, WA)

	NONROAD Source Category SCC	Description	Engine Size (hp)	NONROAD Emission Factors (g/hp-hr) /a Exhaust+ Crankcase VOC	Exhaust NOx	Exhaust CO	Exhaust PM_{10}	Exhaust $PM_{2.5}$	Exhaust SO_2	Exhaust CO_2	Exhaust CH_4	Climate Leaders (g/kWh) /b Exhaust N_2O	Fuel Consumption gal/kWh/c	NONROAD Default Load Factor
101	2270003010	Aerial Lifts	100 < hp <= 175	0.376424	2.443597	1.276235	0.254440	0.246807	0.001927	625.5	0.020662	0.016	0.061	21%
102	2270006015	Air Compressors	50 < hp <= 75	0.119871	2.895070	0.596171	0.078496	0.076141	0.001705	590.0	0.013032	0.015	0.058	43%
103	2270002033	Bore/Drill Rigs	100 < hp <= 175	0.427554	4.897321	1.265764	0.283498	0.274993	0.001948	529.8	0.023823	0.013	0.052	43%
104	2270002042	Cement & Mortar Mixers	100 < hp <= 175	0.436188	5.030485	1.299992	0.266438	0.258445	0.001948	529.8	0.022694	0.013	0.052	43%
105	2270002042	Cement & Mortar Mixers	175 < hp <= 300	0.385082	4.731720	1.157440	0.216126	0.209642	0.001949	529.9	0.019336	0.013	0.052	43%
106	2270002045	Cranes	175 < hp <= 300	0.041190	0.501905	0.115081	0.022971	0.022281	0.001463	530.9	0.002864	0.014	0.052	43%
107	2270002069	Crawler Tractor/Dozers	175 < hp <= 300	0.021693	0.261679	0.093740	0.019313	0.018733	0.001446	536.8	0.001491	0.014	0.053	59%
108	2270002036	Excavators	100 < hp <= 175	0.017780	0.362621	0.116397	0.026855	0.026049	0.001439	536.8	0.001495	0.014	0.053	59%
109	2270003020	Forklifts	75 < hp <= 100	0.009126	0.877277	0.080988	0.014059	0.013638	0.001574	596.1	0.000691	0.015	0.058	59%
110	2270002048	Graders	100 < hp <= 175	0.027585	0.453197	0.184198	0.045672	0.044302	0.001464	536.8	0.002341	0.014	0.053	59%
111	2270002051	Off-highway Trucks	175 < hp <= 300	0.010901	0.128754	0.027887	0.005615	0.005447	0.001417	536.8	0.000494	0.014	0.053	59%
112	2270002081	Other Construction Equipment	50 < hp <= 75	0.139477	2.984215	0.921432	0.109816	0.106521	0.001689	595.8	0.012876	0.015	0.058	59%
113	2270002081	Other Construction Equipment	100 < hp <= 175	0.079433	0.920534	0.324906	0.069897	0.067800	0.001522	536.6	0.005693	0.014	0.053	59%
114	2270002015	Rollers	75 < hp <= 100	0.047096	1.233691	0.449010	0.057364	0.055643	0.001633	596.0	0.003470	0.015	0.058	59%
115	2270002060	Rubber Tire Loaders	100 < hp <= 175	0.039552	0.494267	0.194670	0.042373	0.041102	0.001470	536.7	0.003130	0.014	0.053	59%
116	2270002072	Skid Steer Loaders	100 < hp <= 175	1.058915	5.532446	3.396834	0.638169	0.619024	0.002293	623.5	0.052753	0.016	0.061	21%
117	2270001060	Specialty Vehicle Carts	50 < hp <= 75	0.669291	4.141205	3.279180	0.450044	0.436543	0.002247	694.1	0.025095	0.018	0.068	21%
118	2270002066	Tractors/Loaders/Backhoes	100 < hp <= 175	0.746563	4.152040	2.356593	0.476468	0.462175	0.002172	624.4	0.047102	0.016	0.061	21%
119	2270002030	Trenchers	175 < hp <= 300	0.074220	0.875665	0.280526	0.056045	0.054363	0.001530	536.6	0.004972	0.014	0.053	59%

/a Emission factors for the land-based nonroad engines were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2023.

/b Emission factors for N_2O are based on Table B-8 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016. (0.26 g N2O/gal fuel)

/c Fuel consumption for each type of equipment was estimated based on CO2 emission factor (g/hp-hr) generated from the MOVES2014b model and the emission factor for the mass of CO2 generated per gallon of fuel (10.21 kg CO_2/gal fuel) as presented in Table A-1 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm

2024 Factors for Land-based Nonroad Engines and Other Equipment (Benton County, WA)

	NONROAD Source Category			Exhaust+ Crankcase VOC	NONROAD Emission Factors (g/hp-hr) /a							Climate Leaders (g/kWh) /b Exhaust N_2O	Fuel Consumption gal/kWh /c	NONROAD Default Load Factor
	SCC	Description	Engine Size (hp)		Exhaust NO_x	Exhaust CO	Exhaust PM_{10}	Exhaust $PM_{2.5}$	Exhaust SO_2	Exhaust CO_2	Exhaust CH_4			
201	2270003010	Aerial Lifts	100 < hp <= 175	0.343116	2.244312	1.168366	0.232684	0.225704	0.001907	625.6	0.019457	0.016	0.061	21%
202	2270006015	Air Compressors	50 < hp <= 75	0.107269	2.833988	0.524802	0.066519	0.064523	0.001676	590.1	0.012384	0.015	0.058	43%
203	2270002033	Bore/Drill Rigs	100 < hp <= 175	0.415637	4.758356	1.220811	0.276390	0.268098	0.001938	529.9	0.023742	0.013	0.052	43%
204	2270002042	Cement & Mortar Mixers	100 < hp <= 175	0.431877	4.960604	1.278622	0.262782	0.254898	0.001948	529.8	0.023260	0.013	0.052	43%
205	2270002042	Cement & Mortar Mixers	175 < hp <= 300	0.380258	4.656690	1.136865	0.211408	0.205065	0.001949	530.0	0.019791	0.013	0.052	43%
206	2270002045	Cranes	175 < hp <= 300	0.031792	0.383332	0.089851	0.017676	0.017146	0.001446	531.0	0.002188	0.014	0.052	43%
207	2270002069	Crawler Tractor/Dozers	175 < hp <= 300	0.017180	0.205727	0.066568	0.013666	0.013256	0.001434	536.8	0.001081	0.014	0.053	59%
208	2270002036	Excavators	100 < hp <= 175	0.013805	0.294341	0.088521	0.019202	0.018626	0.001428	536.8	0.001122	0.014	0.053	59%
209	2270003020	Forklifts	75 < hp <= 100	0.008068	0.863434	0.061159	0.011000	0.010670	0.001571	596.1	0.000591	0.015	0.058	59%
210	2270002048	Graders	100 < hp <= 175	0.019442	0.340177	0.127815	0.030156	0.029251	0.001443	536.8	0.001608	0.014	0.053	59%
211	2270002051	Off-highway Trucks	175 < hp <= 300	0.010204	0.120191	0.023612	0.004752	0.004610	0.001415	536.8	0.000429	0.014	0.053	59%
212	2270002081	Other Construction Equipment	50 < hp <= 75	0.122516	2.900716	0.785789	0.091306	0.088567	0.001667	595.8	0.012211	0.015	0.058	59%
213	2270002081	Other Construction Equipment	100 < hp <= 175	0.066363	0.777606	0.274295	0.058201	0.056455	0.001502	536.6	0.004835	0.014	0.053	59%
214	2270002015	Rollers	75 < hp <= 100	0.034643	1.131882	0.347647	0.045550	0.044183	0.001616	596.1	0.002685	0.015	0.058	59%
215	2270002060	Rubber Tire Loaders	100 < hp <= 175	0.030069	0.397966	0.158162	0.034918	0.033870	0.001456	536.7	0.002379	0.014	0.053	59%
216	2270002072	Skid Steer Loaders	100 < hp <= 175	1.044565	5.461095	3.340533	0.631123	0.612190	0.002293	623.6	0.054061	0.016	0.061	21%
217	2270001060	Specialty Vehicle Carts	50 < hp <= 75	0.612170	3.999074	3.017768	0.410255	0.397947	0.002220	694.2	0.024358	0.018	0.068	21%
218	2270002066	Tractors/Loaders/Backhoes	100 < hp <= 175	0.645219	3.609054	2.049890	0.418799	0.406235	0.002105	624.7	0.041111	0.016	0.061	21%
219	2270002030	Trenchers	175 < hp <= 300	0.062155	0.730293	0.232913	0.046190	0.044804	0.001509	536.7	0.004169	0.014	0.053	59%

/a Emission factors for the land-based nonroad engines were estimated using EPA's MOVES2014b emission model for an assumed construction year of 2024.

/b Emission factors for N_2O are based on Table B-8 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016. (0.26 g N2O/gal fuel)

/c Fuel consumption for each type of equipment was estimated based on CO2 emission factor (g/hp-hr) generated from the MOVES2014b model and the emission factor for the mass of CO2 generated per gallon of fuel (10.21 kg CO_2/gal fuel) as presented in Table A-1 of the EPA report, "Direct Emissions from Mobile Combustion Sources, U.S. EPA Center for Corporate Leadership – Greenhouse Gas Inventory Guidance," EPA430-K-16-004, January 2016.

Horse Heaven Wind Farm Emission Factors

2023 Factor for On-road Vehicles (Benton County, WA)

301	Diesel Combination Long-haul	0.19708	4.36280	2.06888	0.08199	0.07543	0.00554	1653.0	0.02078	0.00187	1654.0	6.18
302	Truck	0.32863	5.72492	2.40662	0.15755	0.14494	0.00584	1729.2	0.03852	0.00376	1731.2	5.90
303	Diesel Refuse Truck	0.12184	1.62455	1.06090	0.03698	0.03402	0.00310	926.1	0.02096	0.00313	927.6	11.02
304	Diesel Single Unit Long-haul Truck	0.34450	1.98908	1.22486	0.04459	0.04102	0.00337	1005.3	0.14599	0.00583	1010.7	10.16
305	Diesel Single Unit Short-haul Truck	0.28924	1.80128	1.98747	0.06054	0.05570	0.00206	607.4	0.04553	0.00301	608.6	16.81
306	Diesel Light Commercial Truck	0.27542	0.17850	4.10694	0.00691	0.00611	0.00217	327.2	0.02458	0.00515	329.1	31.20

/a Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2023 using the default input files for calendar year 2023 from the State of Washington Department of Ecology.

2024 Factor for On-road Vehicles (Benton County, WA)

401	Diesel Combination Long-haul	0.18245	4.08130	2.00034	0.07144	0.06572	0.00542	1617.7	0.01996	0.00187	1618.7	6.31
402	Truck	0.28885	5.26539	2.30820	0.13000	0.11960	0.00575	1705.6	0.03780	0.00376	1707.6	5.99
403	Diesel Refuse Truck	0.11464	1.55932	1.04570	0.03728	0.03430	0.00305	909.8	0.02010	0.00313	911.2	11.22
404	Diesel Single Unit Long-haul Truck	0.32730	1.85878	1.18535	0.03787	0.03484	0.00331	987.2	0.14565	0.00582	992.5	10.34
405	Diesel Single Unit Short-haul Truck	0.25216	1.59025	1.72447	0.05833	0.05367	0.00199	589.2	0.04557	0.00301	590.4	17.33
406	Diesel Light Commercial Truck	0.26095	0.14939	3.96998	0.00685	0.00606	0.00212	319.4	0.02291	0.00492	321.2	31.97

/a Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2024 using the default input files for calendar year 2024 from the State of Washington Department of Ecology.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

Horse Heaven Wind Farm MOVES Emission Factors

Benton												
Input Year	**Fuel**	**Vehicle Type**	**Emission**									
			VOC	**NOx**	**CO**	**PM10**	**PM2.5**	**SO2**	**CO2**	**CH4**	**N2O**	**CO2e**
2023	**Diesel**	Combination	0.19708	4.36280	2.06888	0.08199	0.07543	0.00554	1653.0	0.02078	0.00187	1654.0
		Combination	0.20423	4.06897	1.91375	0.07046	0.06483	0.00552	1650.4	0.03287	0.00291	1652.1
		Single Unit Long-haul	0.12184	1.62455	1.06090	0.03698	0.03402	0.00310	926.1	0.02096	0.00313	927.6
		Single Unit Short-haul	0.34450	1.98908	1.22486	0.04459	0.04102	0.00337	1005.3	0.14599	0.00583	1010.7
		Refuse Truck	0.32863	5.72492	2.40662	0.15755	0.14494	0.00584	1729.2	0.03852	0.00376	1731.2
		Light Commercial	0.28924	1.80128	1.98747	0.06054	0.05570	0.00206	607.4	0.04553	0.00301	608.6
		Passenger Car	0.19987	0.10901	4.07464	0.00257	0.00237	0.00114	340.9	0.00394	0.00068	341.2
	Gasoline	Combination	9.23402	7.44913	135.8309	0.07234	0.06400	0.01038	1563.0	0.33299	0.03792	1582.5
		Single Unit Long-haul	0.76947	0.38745	7.97404	0.01577	0.01395	0.00674	1014.4	0.02776	0.00928	1017.8
		Single Unit Short-haul	1.12743	0.66741	11.18899	0.03934	0.03480	0.00717	1079.0	0.06638	0.04681	1093.0
		Refuse Truck	3.28673	4.48433	39.12965	0.18280	0.16171	0.00784	1180.6	0.17743	0.07946	1208.7
		Light Commercial	0.28364	0.31128	5.17191	0.01102	0.00975	0.00298	448.9	0.03101	0.00922	452.2
		Passenger Car	0.27542	0.17850	4.10694	0.00691	0.00611	0.00217	327.2	0.02458	0.00515	329.1

Note: Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2023 using the de input files for Benton County from the State of Washington Department of Ecology.

Benton County, WA												
Input Year	**Fuel**	**Vehicle Type**	**Emission**									
			VOC	**NOx**	**CO**	**PM10**	**PM2.5**	**SO2**	**CO2**	**CH4**	**N2O**	**CO2e**
2024	**Diesel**	Combination	0.18245	4.08130	2.00034	0.07144	0.06572	0.00542	1617.7	0.01996	0.00187	1618.7
		Combination	0.19133	3.85586	1.85778	0.06245	0.05746	0.00541	1616.8	0.03167	0.00291	1618.4
		Single Unit Long-haul	0.11464	1.55932	1.04570	0.03728	0.03430	0.00305	909.8	0.02010	0.00313	911.2
		Single Unit Short-haul	0.32730	1.85878	1.18535	0.03787	0.03484	0.00331	987.2	0.14565	0.00582	992.5
		Refuse Truck	0.28885	5.26539	2.30820	0.13000	0.11960	0.00575	1705.6	0.03780	0.00376	1707.6
		Light Commercial	0.25216	1.59025	1.72447	0.05833	0.05367	0.00199	589.2	0.04557	0.00301	590.4
		Passenger Car	0.19368	0.09464	3.90412	0.00255	0.00235	0.00110	329.4	0.00323	0.00068	329.6
	Gasoline	Combination	7.57169	6.25666	112.9196	0.06689	0.05917	0.01057	1590.7	0.28324	0.03486	1608.1
		Single Unit Long-haul	0.70314	0.32138	7.51225	0.01459	0.01291	0.00669	1007.1	0.02535	0.00864	1010.3
		Single Unit Short-haul	1.08079	0.60565	10.67867	0.03860	0.03415	0.00712	1071.7	0.06378	0.04355	1084.8
		Refuse Truck	3.54956	4.40078	38.29389	0.18183	0.16085	0.00789	1187.7	0.17365	0.07850	1215.3
		Light Commercial	0.27141	0.27620	4.88040	0.01095	0.00968	0.00293	440.5	0.02907	0.00876	443.6
		Passenger Car	0.26095	0.14939	3.96998	0.00685	0.00606	0.00212	319.4	0.02291	0.00492	321.2

Note: Emission factors (lb/VMT) for VOC, NOx, CO, PM10, SO2, and CO2e, were derived using the MOVES2014 model and inputs for calendar year 2024 using the de input files for Benton County from the State of Washington Department of Ecology.

Adapted from Tables 2.15-2 through 2.15-4 of EFSEC ASC

HORSE HEAVEN WIND FARMEPA NEI HAP Emission Factors for Nonroad Diesels

HAP emission factors for nonroad diesels (below) were obtained from ERG, "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," Volume I - Methodology, October 7, 2003 (available from http://www.epa.gov/ttn/chief/net/1999inventory.html#final3haps), Appendix D, Tables D-1 through D-3. This is the reference cited by EPA's National Inventory Model (NMIM), i.e., US EPA, "EPA's National Inventory Model (NMIM), A Consolidated Emissions Modeling System for MOBILE6 and NONROAD", EPA420-R-05-024, December 2005 (available from http://www.epa.gov/otaq/models/nmim/420r05024.pdf), pp. 19-21.

Pollutant	Fraction of	Emissions Factor %
1,3-butadiene	VOC - Exhaust	0.0018616
formaldehyde	VOC	0.11815
benzene	VOC	0.020344
acetaldehyde	VOC	0.05308
ethylbenzene	VOC - Exhaust	0.0031001
styrene	VOC - Exhaust	0.00059448
acrolein	VOC	0.00303
toluene	VOC	0.014967
hexane	VOC	0.0015913
propionaldehyde	VOC	0.011815
2,2,4-trimethylpentane	VOC	0.000719235
2,3,7,8-TCDD TEQ **	tons TEQ/gal	1.90705E-14
xylenes	VOC	0.010582
Total HAP (ratioed to VOC)		**0.239834715**
PAH		
benz[a]anthracene	PM10	0.0000071
benzo[a]pyrene	PM10	0.00000035
benzo[b]fluoranthene	PM10	0.00000049
benzo[k]fluoranthene	PM10	0.00000035
chrysene	PM10	0.0000019
dibenzo[a,h]anthracene	PM10	2.9E-09
indeno[1,2,3-c,d]pyrene	PM10	0.000000079
acenaphthene	PM10	0.0001
acenaphthylene	PM10	0.000084
anthracene	PM10	0.00000043
benzo[g,h,i]perylene	PM10	0.00000019
fluoranthene	PM10	0.000017
fluorene	PM10	0.0001
naphthalene	PM10	0.00046
phenanthrene	PM10	0.00026
pyrene	PM10	0.0000029
Total HAP (ratioed to PM10)		**0.001034792**
chromium	ug/bhp-hr	0.03
manganese	ug/bhp-hr	1.37
nickel	ug/bhp-hr	2.035
Total HAP (Metals ug/bhp-hr)		**3.435**

** Note: the emission rate for 2,3,7,8-TCDD TEQ is significantly lower than any other HAP and therefore, was not factored into the total HAP emission factor.

Horse Heaven Fugitive Dust Emissions Summary
Construction Scenario

Emission Totals by Phase	PM10	PM2.5
	tons	tons
Phase 1		
Exposed surface windblown dust	20.46	10.23
Access road traffic fugitive dust	1,140.97	114.10
Fugitive PM Emissions from Bulldozing activities	1.79	0.88
Fugitive PM Emissions from Grading Activities	0.16	0.01
Total	1,163.38	125.22
Phase 2a		
Exposed surface windblown dust	16.15	8.08
Access road traffic fugitive dust	939.44	93.94
Fugitive PM Emissions from Bulldozing activities	2.06	1.01
Fugitive PM Emissions from Grading Activities	0.14	0.01
Total	957.79	103.05
Phase 2b		
Exposed surface windblown dust	30.33	15.17
Access road traffic fugitive dust	931.87	93.19
Fugitive PM Emissions from Bulldozing activities	1.70	0.84
Fugitive PM Emissions from Grading Activities	0.07	0.01
Total	963.97	109.19

Material Throughput and Vehicle Traffic Count on Unpaved Roads

Construction Phase 1, 2a and 2b

Horse Heaven Wind Farm

Parameters	Phase 1		Phase 2A		Phase 2B	
	Construction Traffic	Workforce	Construction Traffic	Workforce	Construction Traffic	Workforce
Operating Time						
Days per month	24	24	24	24	24	24
Number of Months	11	11	11	11	10	10
Total Operating Days (days) [a]	264	264	264	264	240	240
Daily Operating Hours (hrs/day)	12	12	2	2	2	10
Vehicle and Travel Data						
Vehicle Model [b]	Trucks	Pick up truck	Trucks	Pick up truck	Trucks	Pick up truck
Empty Vehicle Weight (tons) [c]	25.5	2.3	25.5	2.3	25.5	2.3
Vehicle Capacity (tons)	19.0	0.8	19.0	0.8	19.0	0.8
Loaded Vehicle Weight (tons)	44.5	3.0	44.5	3.0	44.5	3.0
W = Average Vehicle Weight (tons)	35.0	2.7	35.0	2.7	35.0	2.7
Number of Vehicles (duration)	52,584	63,360	42,212	56,496	39,618	65,040
Number of Vehicles (daily)	200	240	160	214	165	271
D = Distance traveled on unpaved roads (2-way miles) [d]	50.0	40.0	50.0	40.0	50.0	40.0
Daily Vehicle Miles Travelled (VMT)	10000.0	9600.0	8000.0	8560.0	8250.0	10840.0
Activity Duration Vehicle Miles Travelled (VMT)	2,629,200	2,534,400	2,110,600	2,259,840	1,980,900	2,601,600

Notes:

[a] Operating days and months are based on construction schedule information obtained from the Table Summary of Construction Schedule by Phase.

[b] Typical vehicle model to transport construction material. It assumed pick up trucks for workers.

[c] Empty vehicle weights were obtained from technical specifications of each vehicle.

[d] Hauling distance is conservatively assume that on road vehicles travel 50 miles per day and workers average daily round trip commute is approximately 40 miles per day.

Fugitive Particulate Matter (PM) Emissions from Vehicle Traffic on Unpaved Roads
Construction Phase 1, 2a and 2b
Horse Heaven Wind Farm

Parameters	Phase 1				Phase 2A				Phase 2B			
	Construction Traffic		Workforce		Construction Traffic		Workforce		Construction Traffic		Workforce	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]												
W = Average Vehicle Weight (tons)	35.0	35.0	2.7	2.7	35.0	35.0	2.7	2.7	35.0	35.0	2.7	2.7
D = Distance traveled on unpaved roads (2-way miles)	50.0	50.0	40.0	40.0	50.0	50.0	40.0	40.0	50.0	50.0	40.0	40.0
Daily Operation Hours (hrs/day)	12	12	12	12	2	2	2	2	2	2	10	10
Total No. of Operating Days for activity (days)	264	264	264	264	264	264	264	264	240	240	240	240
No. of truck trips per day (trucks/day)	200	200	240	240	160	160	214	214	165	165	271	271
Total No. of trucks for activity (trucks)	52,584	52,584	63,360	63,360	42,212	42,212	56,496	56,496	39,618	39,618	65,040	65,040
Daily Vehicle Miles Travelled (VMT)	10,000	10,000	9,600	9,600	8,000	8,000	8,560	8,560	8,250	8,250	10,840	10,840
Activity Duration Vehicle Miles Travelled (VMT)	2,629,200	2,629,200	2,534,400	2,534,400	2,110,600	2,110,600	2,259,840	2,259,840	1,980,900	1,980,900	2,601,600	2,601,600
Site Characteristics												
k = Particle size multiplier (lb/VMT) [e]	1.5	0.15	1.5	0.15	1.5	0.15	1.5	0.15	1.5	0.15	1.5	0.15
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [c]	72	72	72	72	72	72	72	72	72	72	72	72
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency												
Dust Control Efficiency (%) [f]	75	75	75	75	75	75	75	75	75	75	75	75
Emission Factors [a]												
Emission Factor (lb/VMT) - Daily	3.32	0.332	1.0	0.1	3.3	0.3	1.0	0.1	3.3	0.3	1.0	0.1
Emission Factor (lb/VMT) - Annual	2.67	0.27	0.83	0.08	2.67	0.27	0.83	0.08	2.67	0.27	0.83	0.08
Emission Rates [a]												
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	33,222.4	3,322.2	9,984.6	998.5	26,577.9	2,657.8	8,903.0	890.3	27,408.5	2,740.8	11,274.3	1,127.4
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	3,505.9	350.6	1,058.0	105.8	2,814.4	281.4	943.4	94.3	2,641.4	264.1	1,086.0	108.6
Controlled Daily Emissions (lb/day)	8,305.6	830.6	2,496.2	249.6	6,644.5	664.4	2,225.7	222.6	6,852.1	685.2	2,818.6	281.9
Controlled Annual Emissions (TPY)	876.5	87.6	264.5	26.4	703.6	70.4	235.8	23.6	660.4	66.0	271.5	27.2
Controlled Hourly Emissions (lb/hr, daily basis)	346.1	34.6	104.0	10.4	276.9	27.7	92.7	9.3	285.5	28.6	117.4	11.7
Emission Factor (lb/hr/mi)	13.8	1.4	5.2	0.5	11.1	1.1	4.6	0.5	11.4	1.1	5.9	0.6

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.2 (Unpaved Roads) Equation 1a (Industrial Sites) -

E = k * (s/12)^a * (W/3)^b * (365-P)/365

[b] See Table 1 for number of vehicles and travel data.

[c] Particle size multiplier and constants from AP-42 Table 13.2.2-2 for industrial roads

[d] Silt content based on the Table 13.2.2-1 of AP-42 for Construction Sites

[e] Precipitation data based on annual summary data for 2020 Meteorological Data - Richland Airport (Benton County)

[f] Dust control efficiency based on 75% for basic watering on unpaved roads according to the Document Emission Factors for Paved and Unpaved Roads by the Department of Environmental Quality, State of Utah, January 2015

Fugitive PM Emissions from Bulldozers
Construction Phase 1
Horse Heaven Wind Farm

Parameters	Bulldozing/Scraping Activities		
	Wind	Solar	Battery
ID	**B1**	**B2**	**B3**
Operational Data [b]			
Daily Operation Hours (hrs/day)	12	12	12
Total No. of Operating Months for activity	8	10.1	4
No. of active bulldozers/loaders/excavators/scrapers (per month)	19	19	2
Site Characteristics [c]			
M = Moisture content (%)	3.4	3.4	3.4
s = Silt content of site specific unpaved roads (%)	7.5	7.5	7.5
Control Efficiency			
Dust Control Method [d]	Watering	Watering	Watering
Dust Control Efficiency (%)	70	70	70
Calculated PM Emission Factors (EF) [a]			
Uncontrolled TSP EF (lb/hr)	13.03	13.03	13.03
Controlled TSP EF (lb/hr)	3.91	3.91	3.91
Uncontrolled PM_{15} EF (lb/hr)	3.70	3.70	3.70
Controlled PM_{15} EF (lb/hr)	1.11	1.11	1.11
Uncontrolled PM_{10} EF (lb/hr)	2.78	2.78	2.78
Controlled PM_{10} EF (lb/hr)	0.83	0.83	0.83
Uncontrolled $PM_{2.5}$ EF (lb/hr)	1.37	1.37	1.37
Controlled $PM_{2.5}$ EF (lb/hr)	0.41	0.41	0.41
Estimated Emissions Rates (ER) [e]			
PM_{10} ER lb/hr (daily basis)	7.86	7.86	0.98
PM_{10} ER tons (year)	0.79	0.95	0.047
$PM_{2.5}$ ER lb/hr (daily basis)	3.88	3.88	0.48
$PM_{2.5}$ ER tons (year)	0.391	0.470	0.023

Notes:

[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on bulldozing for overburden:

Uncontrolled TSP EF (UEF) Equation :	UEF (lb/hr) = 5.7 x $(s)^{1.2}/(M)^{1.3}$
Controlled TSP EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled PM_{15} EF (UEF) Equation :	UEF (lb/hr) = 1.0 x $(s)^{1.5}/(M)^{1.4}$
Controlled PM_{15} EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled PM_{10} EF (UEF) Equation :	UEF (kg/hr) = 0.75 x UEF of PM_{15}
Controlled PM_{10} EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled $PM_{2.5}$ EF (UEF) Equation :	UEF (kg/hr) = 0.105 x UEF of TSP
Controlled $PM_{2.5}$ EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]

[b] The quantity of the bulldozers, operational hours and months were based on the Construction Emissions for Phase 1.

[c] Moisture content and silt sample data based on the Table 13.2.4-1 of the AP-42.

[d] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of

[e] ER = EF x No. of active bulldozers.

Fugitive PM Emissions from Bulldozers
Construction Phase 2a
Horse Heaven Wind Farm

Parameters	Bulldozing/Scraping Activities		
	Wind	Solar	Battery
ID	**B4**	**B5**	**B6**
Operational Data [b]			
Daily Operation Hours (hrs/day)	12	12	12
Total No. of Operating Months for activity	6	10	4
No. of active bulldozers/loaders/excavators/scrapers (per month)	34	17	7
Site Characteristics [c]			
M = Moisture content (%)	3.4	3.4	3.4
s = Silt content of site specific unpaved roads (%)	7.5	7.5	7.5
Control Efficiency			
Dust Control Method [d]	Watering	Watering	Watering
Dust Control Efficiency (%)	70	70	70
Calculated PM Emission Factors (EF) [a]			
Uncontrolled TSP EF (lb/hr)	13.03	13.03	13.03
Controlled TSP EF (lb/hr)	3.91	3.91	3.91
Uncontrolled PM_{15} EF (lb/hr)	3.70	3.70	3.70
Controlled PM_{15} EF (lb/hr)	1.11	1.11	1.11
Uncontrolled PM_{10} EF (lb/hr)	2.78	2.78	2.78
Controlled PM_{10} EF (lb/hr)	0.83	0.83	0.83
Uncontrolled $PM_{2.5}$ EF (lb/hr)	1.37	1.37	1.37
Controlled $PM_{2.5}$ EF (lb/hr)	0.41	0.41	0.41
Estimated Emissions Rates (ER) [e]			
PM_{10} ER lb/hr (daily basis)	14.01	6.88	2.95
PM_{10} ER tons (year)	1.08	0.84	0.142
$PM_{2.5}$ ER lb/hr (daily basis)	6.90	3.39	1.45
$PM_{2.5}$ ER tons (year)	0.533	0.412	0.070

Notrs:

[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on bulldozing for overburden:

Uncontrolled TSP EF (UEF) Equation :	UEF (lb/hr) = 5.7 x $(s)^{1.2}/(M)^{1.3}$
Controlled TSP EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled PM_{15} EF (UEF) Equation :	UEF (lb/hr) = 1.0 x $(s)^{1.5}/(M)^{1.4}$
Controlled PM_{15} EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled PM_{10} EF (UEF) Equation :	UEF (kg/hr) = 0.75 x UEF of PM_{15}
Controlled PM_{10} EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled $PM_{2.5}$ EF (UEF) Equation :	UEF (kg/hr) = 0.105 x UEF of TSP
Controlled $PM_{2.5}$ EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]

[b] The quantity of the bulldozers, operational hours and months were based on the Construction Emissions for Phase 2a.

[c] Moisture content and silt sample data based on the Table 13.2.4-1 of the AP-42.

[d] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of Utah, January 2015

[e] ER = EF x No. of active bulldozers.

Fugitive PM Emissions from Bulldozers
Construction Phase 2b
Horse Heaven Wind Farm

Parameters	Bulldozing/Scraping Activities
	Wind
ID	**B7**
Operational Data [b]	
Daily Operation Hours (hrs/day)	12
Total No. of Operating Months for activity	10
No. of active bulldozers/ loaders/ excavators/ scrapers (per month)	34
Site Characteristics [c]	
M = Moisture content (%)	3.4
s = Silt content of site specific unpaved roads (%)	7.5
Control Efficiency	
Dust Control Method [d]	Watering
Dust Control Efficiency (%)	70
Calculated PM Emission Factors (EF) [a]	
Uncontrolled TSP EF (lb/hr)	13.03
Controlled TSP EF (lb/hr)	3.91
Uncontrolled PM_{15} EF (lb/hr)	3.70
Controlled PM_{15} EF (lb/hr)	1.11
Uncontrolled PM_{10} EF (lb/hr)	2.78
Controlled PM_{10} EF (lb/hr)	0.83
Uncontrolled $PM_{2.5}$ EF (lb/hr)	1.37
Controlled $PM_{2.5}$ EF (lb/hr)	0.41
Estimated Emissions Rates (ER) [e]	
PM_{10} ER lb/hr (daily basis)	14.01
PM_{10} ER tons (year)	1.70
$PM_{2.5}$ ER lb/hr (daily basis)	6.90
$PM_{2.5}$ ER tons (year)	0.837

Notes:

[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on bulldozing for overburden:

Uncontrolled TSP EF (UEF) Equation :	UEF (lb/hr) = $5.7 \times (s)^{1.2} / (M)^{1.3}$
Controlled TSP EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled PM_{15} EF (UEF) Equation :	UEF (lb/hr) = $1.0 \times (s)^{1.5} / (M)^{1.4}$
Controlled PM_{15} EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled PM_{10} EF (UEF) Equation :	UEF (kg/hr) = 0.75 x UEF of PM_{15}
Controlled PM_{10} EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]
Uncontrolled $PM_{2.5}$ EF (UEF) Equation :	UEF (kg/hr) = 0.105 x UEF of TSP
Controlled $PM_{2.5}$ EF (CEF) Equation :	CEF (lb/hr) = UEF (lb/hr) x [100 - Control efficiency (%)]

[b] The quantity of the bulldozers, operational hours and months were based on the Construction Emissions for Phase

[c] Moisture content and silt sample data based on the Table 13.2.4-1 of the AP-42.

[d] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of Utah, January 2015

[e] ER = EF x No. of active bulldozers.

Fugitive Particulate Matter (PM) Emissions from Grading Activities

Construction Phase 1

Horse Heaven Wind Farm

Parameters	Grading Activities during Phase 1		
	Wind	**Solar**	**Battery**
ID	**G1**	**G2**	**G3**
Operational Data [a]			
Daily Operation Hours (hrs/day)	12	12	12
Total No. of Operating Months	8	10	4
No. of active motor graders per month	19	14	2
Vehicle Data			
Mean Vehicle Speed (S) (mph) [b]	3.3	3.3	3.3
Basis for vehicle miles traveled (VMT)			
Number of vehicles			
daily	7	7	7
annually	159	71	28
Grader Utilization per day (%)	50	50	50
Distance traveled/vehicle/day (miles per grader)	19.8	19.8	19.8
VMT (no. vehicles x mi traveled)			
daily	138.6	138.6	138.6
annually	1164.2	1399.9	554.4
Control Efficiency			
Dust Control Method [c]	Watering	Watering	Watering
Dust Control Efficiency (%)	70	70	70
Scaling Factors (unitless)			
TSP	1.0	1.0	1.0
PM_{15}	1.0	1.0	1.0
PM_{10}	0.6	0.6	0.6
$PM_{2.5}$	0.031	0.031	0.031
Calculated Emission Factors (EF) [d]			
Uncontrolled TSP EF (lb/VMT)	0.79	0.79	0.79
Uncontrolled PM_{15} EF (lb/VMT)	0.56	0.56	0.56
Uncontrolled PM_{10} EF (lb/VMT)	0.33	0.33	0.33
Uncontrolled $PM_{2.5}$ EF (lb/VMT)	0.02	0.02	0.02
Estimated Uncontrolled Emission Rate (ER) [e]			
TSP ER lb/hr (daily basis)	4.57	4.57	4.57
tons/yr	0.46	0.55	0.22
PM_{10} ER lb/hr (daily basis)	1.92	1.92	1.92
tons/yr	0.19	0.23	0.09
$PM_{2.5}$ ER lb/hr (daily basis)	0.14	0.14	0.14
tons/yr	0.01	0.02	0.01
Estimated Controlled Emission Rate (ER)			
TSP ER lb/hr (daily basis)	1.37	1.37	1.37
tons/yr	0.14	0.17	0.07
PM_{10} ER lb/hr (daily basis)	0.58	0.58	0.58
tons/yr	0.06	0.07	0.03
$PM_{2.5}$ ER lb/hr (daily basis)	0.04	0.04	0.04
tons/yr	0.00	0.01	0.00

Notes:

[a] The quantity of the graders, operational hours and months were based on the Construction Emissions for Phase 1

[b] Mean vehicle speed for graders based on the grader operations' time estimations by http://www.ocw.upj.ac.id/

[c] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of Utah, January 2015

[d] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on grading

Uncontrolled PM_{15} EF (UEF) Equation — UEF (lb/VMT) = $0{,}051 \times S^{2{,}0}$ x Scaling Factor

Uncontrolled TSP EF (UEF) Equation — UEF (lb/VMT) = $0.040(S)^{2.5}$ x Scaling Factor

PM10 EF = PM15 EF x Scaling factor for PM-10

PM2.5 EF = TSP EF x Scaling factor for PM-2.5

[e] ER = EF x VMT

Fugitive Particulate Matter (PM) Emissions from Grading Activities
Construction Phase 2a
Horse Heaven Wind Farm

Parameters	Grading Activities during Phase 2a		
	Wind	Solar	Battery
ID	**G4**	**G5**	**G6**
Operational Data [a]			
Daily Operation Hours (hrs/day)	12	12	12
Total No. of Operating Months	6	10	4
No. of active motor graders per month	24	12	14
Vehicle Data			
Mean Vehicle Speed (S) (mph) [b]	3.3	3.3	3.3
Basis for vehicle miles traveled (VMT)			
Number of vehicles			
daily	7	7	7
annually	152	71	28
Grader Utilization per day (%)	50	50	50
Distance traveled/vehicle/day (miles per grader)	19.8	19.8	19.8
VMT (no. vehicles x mi traveled)			
daily	138.6	138.6	138.6
annually	891.7	1404.5	554.4
Control Efficiency			
Dust Control Method [c]	Watering	Watering	Watering
Dust Control Efficiency (%)	70	70	70
Scaling Factors (unitless)			
TSP	1.0	1.0	1.0
PM_{15}	1.0	1.0	1.0
PM_{10}	0.6	0.6	0.6
$PM_{2.5}$	0.031	0.031	0.031
Calculated Emission Factors (EF) [d]			
Uncontrolled TSP EF (lb/VMT)	0.79	0.79	0.79
Uncontrolled PM_{15} EF (lb/VMT)	0.56	0.56	0.56
Uncontrolled PM_{10} EF (lb/VMT)	0.33	0.33	0.33
Uncontrolled $PM_{2.5}$ EF (lb/VMT)	0.02	0.02	0.02
Estimated Uncontrolled Emission Rate (ER) [e]			
TSP ER lb/hr (daily basis)	4.57	4.57	4.57
tons/yr	0.35	0.56	0.22
PM_{10} ER lb/hr (daily basis)	1.92	1.92	1.92
tons/yr	0.15	0.23	0.09
$PM_{2.5}$ ER lb/hr (daily basis)	0.14	0.14	0.14
tons/yr	0.01	0.02	0.01
Estimated Controlled Emission Rate (ER)			
TSP ER lb/hr (daily basis)	1.37	1.37	1.37
tons/yr	0.11	0.17	0.07
PM_{10} ER lb/hr (daily basis)	0.58	0.58	0.58
tons/yr	0.04	0.07	0.03
$PM_{2.5}$ ER lb/hr (daily basis)	0.04	0.04	0.04
tons/yr	0.00	0.01	0.00

Notes:

[a] The quantity of the graders, operational hours and months were based on the Construction Emissions for Phase 2a

[b] Mean vehicle speed for graders based on the grader operations' time estimations by http://www.ocw.upj.ac.id/

[c] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of Utah, January 2015

[d] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, ba

Uncontrolled PM_{15} EF (UEF) Equation — UEF (lb/VMT) = 0,051 x $S^{2,0}$ x Scaling Factor

Uncontrolled TSP EF (UEF) Equation — UEF (lb/VMT) = 0.040$(S)^{2.5}$ x Scaling Factor

PM10 EF = PM15 EF x Scaling factor for PM-10

PM2.5 EF = TSP EF x Scaling factor for PM-2.5

[e] ER = EF x VMT

Fugitive Particulate Matter (PM) Emissions from Grading Activities
Construction Phase 2b
Horse Heaven Wind Farm

Parameters	Grading Activities during Phase 2b
	Wind
ID	**G7**
Operational Data [a]	
Daily Operation Hours (hrs/day)	12
Total No. of Operating Months	10
No. of active motor graders per month	25
Vehicle Data	
Mean Vehicle Speed (S) (mph) [b]	3.3
Basis for vehicle miles traveled (VMT)	
Number of vehicles	
daily	7
annually	250
Grader Utilization per day (%)	50
Distance traveled/vehicle/day (miles per grader)	19.8
VMT (no. vehicles x mi traveled)	
daily	138.6
annually	1399.9
Control Efficiency	
Dust Control Method [c]	Watering
Dust Control Efficiency (%)	70
Scaling Factors (unitless)	
TSP	1.0
PM_{15}	1.0
PM_{10}	0.6
$PM_{2.5}$	0.031
Calculated Emission Factors (EF) [d]	
Uncontrolled TSP EF (lb/VMT)	0.79
Uncontrolled PM_{15} EF (lb/VMT)	0.56
Uncontrolled PM_{10} EF (lb/VMT)	0.33
Uncontrolled $PM_{2.5}$ EF (lb/VMT)	0.02
Estimated Uncontrolled Emission Rate (ER) [e]	
TSP ER lb/hr (daily basis)	4.57
tons/yr	0.55
PM_{10} ER lb/hr (daily basis)	1.92
tons/yr	0.23
$PM_{2.5}$ ER lb/hr (daily basis)	0.14
tons/yr	0.02
Estimated Controlled Emission Rate (ER)	
TSP ER lb/hr (daily basis)	1.37
tons/yr	0.17
PM_{10} ER lb/hr (daily basis)	0.58
tons/yr	0.07
$PM_{2.5}$ ER lb/hr (daily basis)	0.04
tons/yr	0.01

Notes:

[a] The quantity of the graders, operational hours and months were based on the Construction Emissions for Phase 2b.

[b] Mean vehicle speed for graders based on the grader operations' time estimations by http://www.ocw.upj.ac.id/

[c] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of Utah, January 2015

[d] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on grading

Uncontrolled PM_{15} EF (UEF) Equation — UEF (lb/VMT) = 0,051 x $S^{2,0}$ x Scaling Factor

Uncontrolled TSP EF (UEF) Equation — UEF (lb/VMT) = 0.040$(S)^{2.5}$ x Scaling Factor

PM10 EF = PM15 EF x Scaling factor for PM-10

PM2.5 EF = TSP EF x Scaling factor for PM-2.5

[e] ER = EF x VMT

Fugitive PM Emissions from Wind Erosion of Exposed Surface Areas
Construction Phase 1, 2a and 2b
Horse Heaven Wind Farm

Parameters	Exposed surface windblown dust		
	Construcion Phase 1	Construcion Phase 2a	Construcion Phase 1
ID	**WE1**	**WE1**	**WE1**
Operational Data			
Hours of Exposure (hrs/day)	24	24	24
Unvegetated Surface Area (acres) [b]	358.9	283.4	532.1
Site Characteristics [c]			
Daily hours of precipitation ≥ 0.25 mm (p)	0	0	0
Annual days of precipitation ≥ 0.25 mm (p)	72	72	72
Control Efficiency			
Dust Control Method [d]	Watering as needed	Watering as needed	Watering as needed
Dust Control Efficiency (%) [d]	70	70	70
Particle Size Multipliers (k) [e]			
For TSP	1.0	1.0	1.0
For PM_{10}	0.50	0.50	0.50
For $PM_{2.5}$	0.25	0.25	0.25
Calculated PM Emission Factors (EF) [a]			
Uncontrolled TSP EF (ton/acre/yr)	0.38	0.38	0.38
Uncontrolled PM_{10} EF (ton/acre/yr)	0.19	0.19	0.19
Uncontrolled $PM_{2.5}$ EF (ton/acre/yr)	0.095	0.095	0.095
Controlled TSP EF (ton/acre/yr)	0.11	0.11	0.11
Controlled PM_{10} EF (ton/acre/yr)	0.06	0.06	0.06
Controlled $PM_{2.5}$ EF (ton/acre/yr)	0.029	0.029	0.029
Estimated Emissions Rates [a]			
TSP ER lb/hr (daily basis)	9.34	7.38	13.85
TSP ER tons (year)	40.91	32.31	60.66
PM_{10} ER lb/hr (daily basis)	4.67	3.69	6.92
PM_{10} ER tons (year)	20.46	16.15	30.33
$PM_{2.5}$ ER lb/hr (daily basis)	2.34	1.84	3.46
$PM_{2.5}$ ER tons (year)	10.23	8.08	15.17

Notes:

[a] Emission factor equation from Table 11.9-4 (wind erosion of exposed areas) of US EPA AP-42 Section 11.9 for Western Surface Coal Mines:
Uncontrolled TSP EF (UEF) Equation : UEF (ton/acre/yr) = k x 0.38
Controlled TSP EF (CEF) Equation : CEF (ton/acre/yr) = UEF (ton/acre/yr) x [100 - Control efficiency (%)]

[b] Area of unvegetated surface (temporary and permanent disturbance) based on the Table 2.1-1 Project Related Impacts.

[c] Based on hourly surface 2020 meteorological data from the Richland Airport (Benton County)

[d] Dust control efficiency based on 70% for basic watering with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit, according to the Document Emission Factors by the Department of Environmental Quality, State of Utah, January 2015

[e] Particle size based on AP-42 Section 13.2.5 recommendation.

APPENDIX 4.3-2

Tetra Tech 2023 Air Quality Dispersion Modeling Evaluation

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Air Quality Dispersion Modeling Evaluation

Horse Heaven Wind Farm
Concrete Batch Plant and Stationary Engines
Benton County, Washington

June 2023

Prepared for:

Horse Heaven Wind Farm, LLC
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Bothell, WA 98011

TETRA TECH

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
$\mu g/m^3$	micrograms per cubic meter
AP-42	Compilation of Air Pollutant Emission Factors
AQCR	Air Quality Control Region
BCAA	Benton Clean Air Agency
bhp	brake horsepower
BMP	best management practice
BPIP	Building Profile Input Program
CBP	concrete batch plant
CFR	Code of Federal Regulations
CO	carbon monoxide
Ecology	Washington State Department of Ecology
EFSEC	Energy Facility Site Evaluation Council
GEP	Good Engineering Practice
HAP	hazardous air pollutant
hp	horsepower
km	kilometer
lb/hr	pounds per hour
N_2	nitrogen gas
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NO	nitrogen oxide
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NSPS	New Source Performance Standards
O_3	ozone
PAH	polycyclic aromatic hydrocarbons

Acronyms/Abbreviations	Definition
Pb	lead
PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameter equal to or less than 10 micrometers
$PM_{2.5}$	particulate matter with aerodynamic diameter equal to or less than 2.5 micrometers
PTE	potential-to-emit
scf	standard cubic feet
SIA	Significant Impact Area
SIL	Significant Impact Level
SO_2	sulfur dioxide
SO_X	Sulfur oxides
tpd	tons per day
tph	tons per hour
tpy	tons per year
TSP	total suspended particulate matter
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compounds
yd^3	cubic yards
WAAQS	Washington Ambient Air Quality Standard
WAC	Washington Administrative Code

1.0 INTRODUCTION

1.1 PURPOSE

Horse Heaven Wind Farm, LLC (Horse Heaven) is proposing to construct and operate the Horse Heaven Wind Farm (Project) in unincorporated Benton County, Washington, within the Horse Heaven Hills area. The Project would consist of a renewable energy generation facility and is located approximately four (4) miles south/southwest of the city of Kennewick and the larger Tri-Cities urban area, along the Columbia River.

In February 2021, Horse Heaven submitted an Application for Site Certification (ASC) to the Energy Facility Site Evaluation Council (EFSEC). The ASC was updated to incorporate information requested by EFSEC and submitted in December 2022. An initial air quality assessment was one of the resources areas evaluated in the ASC. To refer to the initial air quality assessment, the ASC and its update are available on EFSEC's project website at: https://www.efsec.wa.gov/energy-facilities/horse-heaven-wind-project/horse-heaven-application.

During construction, and as previously evaluated, air emissions would result from use of fuel-burning equipment to support construction, as well as fugitive dust associated with exposed surface windblown dust, access road traffic, bulldozing, and grading activities. At the time the ASC was submitted, the potential for batch plant use and backup diesel generators was identified, but specific locations for this equipment had not yet been determined and as a result, these emissions were not included in the initial air quality analysis. Horse Heaven has since identified temporary locations for a portable concrete batch plant (CBP) and backup diesel generators. The purpose of this report is to provide supplemental environmental analysis related to the potential ambient air quality impacts of the CBP and generator engines. As such, this report provides:

- A description of the proposed configuration of the additional equipment (Section 2);
- An inventory of maximum potential emissions resulting from the additional equipment (Section 3);
- An ambient air quality dispersion modeling analysis to show emissions associated with the additional equipment will comply with ambient air quality standards (Section 5); and
- Detailed emissions calculations (Appendix A) and modeling inputs (Appendix B).

1.2 SUMMARY

The Project will comply with ambient air quality standards, and will do so by accepting permit limits on operating conditions. Bin vent filters will be installed on cement and cement supplement silos to minimize emissions during silo loading operations.

The Project will also implement Best Management Practices for the mitigation of fugitive dust. Fugitive emissions and dust 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.
- Construction materials that could be a source of fugitive dust would be covered when stored.
- 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.
- Erosion-control measures would be implemented to limit deposition of silt to roadways, to minimize a vector for fugitive dust.
- Replanting or graveling disturbed areas will be conducted during and after construction to reduce wind-blown dust.

2.0 PROJECT DESCRIPTION

Horse Heaven is proposing to construct its Project in the Horse Heaven Hills area of Benton County located approximately four (4) miles south/southwest of the city of Kennewick and the larger Tri-Cities urban area, near the Columbia River. The construction of the project will occur over a period of approximately two years, with construction of the eastern portion of the project occurring in the first year (i.e., Phase I) and construction of the western portion of the project occurring in the second year (i.e., Phase II). A portable CBP and backup generators will support the construction of the project. The portable CBP will only be located at the site for a temporary period of 4 months for each phase (i.e., 4 months during Phase I construction and another 4 months during Phase II construction).

This section provides a description of the Project location (Section 2.1), and the proposed equipment to be installed for the Project (Section 2.2).

2.1 PROJECT LOCATION

The Project site is located in the Horse Heaven Hills approximately four (4) miles south/southwest of the city of Kennewick and the larger Tri-Cities urban area, near the Columbia River. The Project is planned to be constructed in two phases across three different locations within the Horse Heaven Hills:

Phase 1: HH-East

The first phase of the Project will include the east substation and the east laydown area located adjacent to each other. Both areas are located near coordinates 46.060611°, -119.206184° and will include four (4) total engines, with three (3) rated at 2,680 brake horsepower (bhp) each and one (1) rated at 670 bhp. The portable CBP will be located at the east laydown area for a duration of approximately four (4) months.

Phase 2: HH-West

The second phase of the Project will include the west substation and west laydown area. The west substation is located near coordinates 46.188129°, -119.551248° and will include three (3) diesel engines rated at 2,680 bhp each. The west laydown area is located near coordinates 46.116957°, -119.356656° and will include the portable CBP for a duration of approximately four (4) months and one (1) diesel engine rated at 670 bhp.

The substations and laydown yard locations are shown in Figure 2-1. The topography surrounding the Project consists of gently sloping terrain as indicated in the figure.

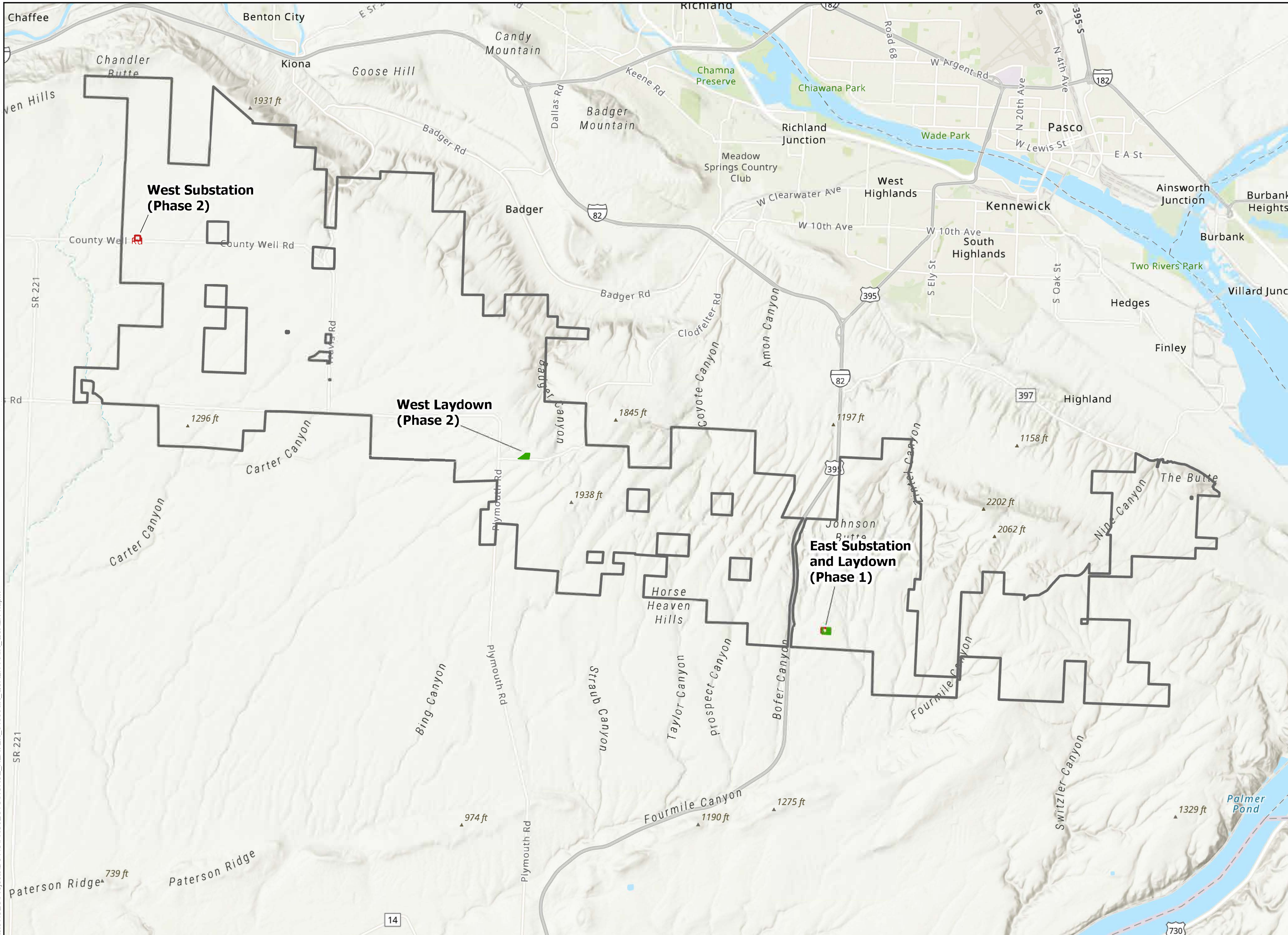
The Project is located in the USEPA's South Central Washington Intrastate Air Quality Control Region (AQCR). The AQCR is designated as attainment or unclassifiable for all criteria pollutants.

2.2 SUMMARY OF PROPOSED PROJECT

The Project includes backup diesel generators and portable concrete batching equipment to be temporarily installed on site. Aggregate and sand brought to the site by truck will be stored in the laydown areas immediately adjacent to the CBP. A front-end loader will be used to distribute materials between storage areas and the CBP operations.

2.2.1 Backup Diesel Generators

Two types of diesel generators are proposed for this Project. The substations will utilize engines for which the Cummins Model QSK60-G6 engine rated at 2,680 bhp each is representative. The engines will meet the Tier II emission standards as specified under 40 Code of Federal Regulation (CFR) 89.112(a). Each engine will operate no more than 500 hours per year during the entire duration of the Project. The laydown areas will utilize engines for which the Cummins Model QSK60-GA engines rated at 670 bhp each is representative. Similarly, these engines will meet the Tier II emission standards as specified under 40 CFR 89.112(a) and will not operate for more than 500 hours per year during the entire duration of the Project.



1:140,000 WGS 1984 UTM Zone 11N

0 1 2 4 6 8 Miles

NOT FOR CONSTRUCTION

Horse Heaven Wind Project

SCOUT CLEAN ENERGY

Figure 2-1
Site Location
BENTON COUNTY, WA

- Project Lease Boundary
- Laydown Area
- Substation

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Reference Map

2.2.2 Concrete Batch Plant (Ready-Mix Plant)

The basic manufacturing process of a CBP involves mixing sand, aggregate, cement, cement supplements, and water to produce concrete. Generally, sand and aggregate are loaded into hoppers which feed enclosed conveyor belts that transfer the materials to weigh hoppers according to the mix requested by the contractor. Cement and cement supplements are also loaded by pneumatic conveying systems into the weigh hoppers. All of these materials are then loaded into a ready-mix delivery truck along with water. The rotating drum on the delivery truck mixes the materials to achieve the desired product consistency. The loaded delivery truck leaves the premises to deliver the product. Product mixing continues to occur onboard the truck during transit to the delivery site. Figure 2-2 shows a representative schematic process flow diagram of a CBP.

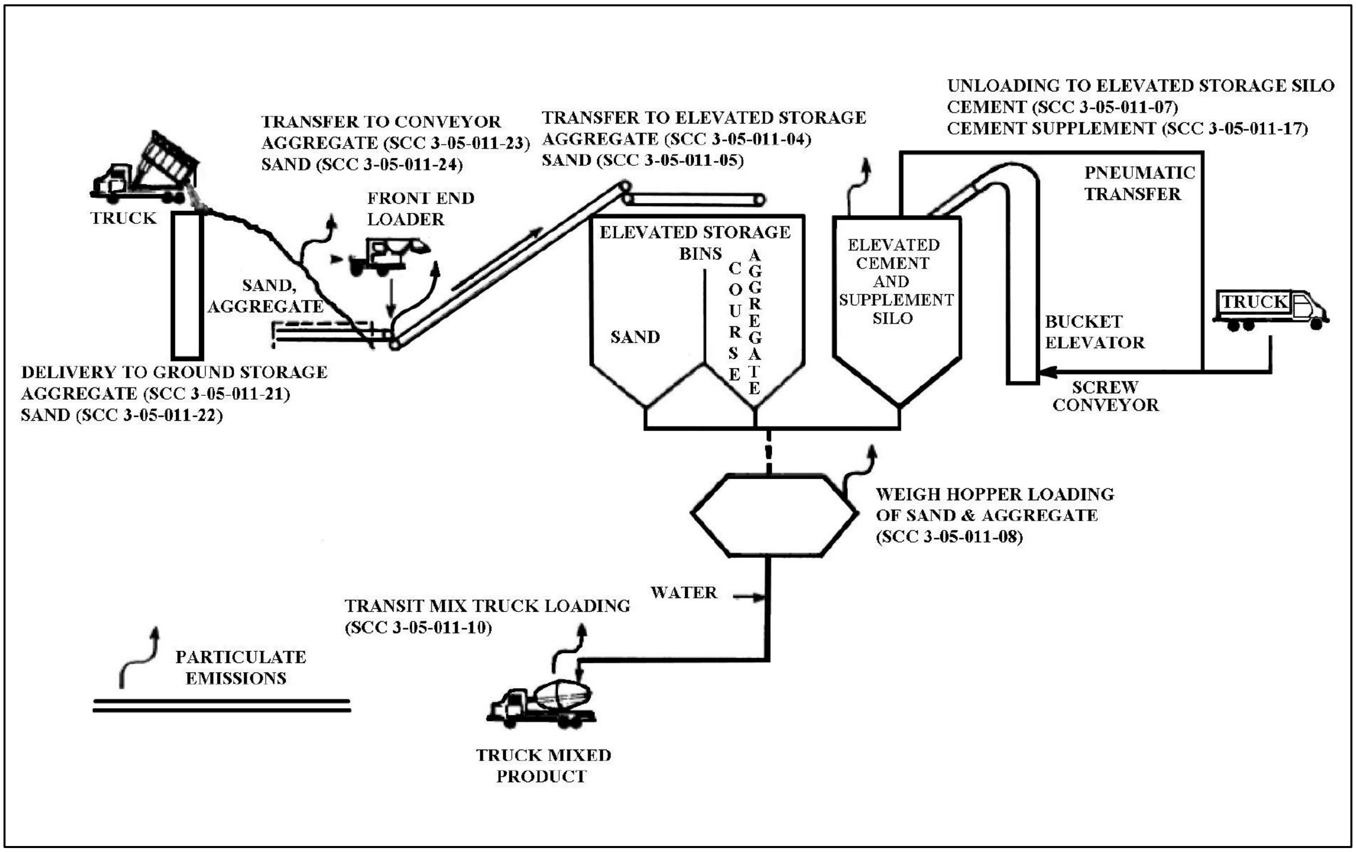

Figure 2-2. Representative Schematic Process Flow Diagram for a Concrete Batch Plant (adapted from USEPA AP-42 Compilation of Air Emission Factors, Figure 11.12-1).

The cement and cement supplement silos will be equipped with high efficiency bin vent filters. The aggregate and sand storage area will use a commercial water spray system to control dust during material handling. The Project will use washed aggregate and sand when contractor specifications allow, further reducing fugitive dust emissions during material handling. The feed hoppers will be equipped with an enclosed drop to the conveyor to minimize fugitive dust from this activity.

The Project will include sand and aggregate storage areas, equipment such as front-end loaders to transfer material between storage areas and plant areas, and haul roads upon which trucks will travel. Particulate matter in the form of fugitive dust can be generated from all these activities. Best Management Practices (BMPs) will be used to minimize the formation of fugitive dust emissions. Examples of BMPs to be used by the Project include 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.
- Construction materials that could be a source of fugitive dust would be covered when stored.
- 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.
- Erosion-control measures would be implemented to limit deposition of silt to roadways, to minimize a vector for fugitive dust.
- Replanting or graveling disturbed areas will be conducted during and after construction to reduce wind-blown dust.

Implementation of these BMPs is expected to meet Benton Clean Air Agency (BCAA) requirements, which prohibit off-property transport of visible fugitive dust emissions.

3.0 EMISSIONS ESTIMATES

This section describes how emissions from the Project were calculated based upon activity data supplied by Horse Heaven, emission factors obtained from USEPA's AP-42 Compilation of Air Pollutant Emission Factors (AP-42), and emissions standards established for the generator engines. Detailed emissions calculations are provided in Appendix A.

From a practical perspective relevant to the Project and its emissions, the list of regulated New Source Review (NSR) pollutants includes the six criteria pollutants for which National Ambient Air Quality Standards (NAAQS) have been established and those pollutants that are subject to the New Source Performance Standards (NSPS) promulgated pursuant to Section 111 of the federal Clean Air Act (CAA).

The six criteria pollutants are: sulfur dioxide (SO_2), particulate matter (PM), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Volatile organic compounds (VOCs) and nitrogen oxides (NO_X) are included by virtue of being established by USEPA as ozone precursors. For regulatory purposes, PM is further classified by particle size. $PM_{2.5}$ includes all particles with an aerodynamic diameter of less than 2.5 microns. PM_{10} includes all particles with an aerodynamic diameter of less than 10 microns. Total suspended particulate includes particles of all sizes.

The list of Hazardous Air Pollutants (HAPs) is defined in Section 112(b) of the CAA and in 40 CFR Part 63 Subpart C. From a practical perspective, the HAPs to be emitted from the Project are subsets of regulated NSR pollutants, particularly trace metals (PM) and trace organics (VOCs).

Both short-term emissions (durations of 24 hours or less) and long-term emissions (construction duration of less than one year) estimates are provided. Emissions of regulated NSR pollutants and HAPs were calculated. The following sections describe how emissions from each Project area were calculated.

3.1 BACKUP DIESEL GENERATORS EMISSIONS

The diesel generators will serve as backup power sources during the construction period. The HH-West Step-up Substation will have three (3) identical engines rated at approximately 2,680 bhp each. The HH-West CBP will have one (1) engine rated at approximately 670 bhp. The HH-East Substation will have three (3) identical engines rated at approximately 2,680 bhp each. The HH-East CBP will have one (1) engine rated at approximately 670 bhp. In summary, there will be a total of eight (8) nonroad engines utilized throughout the Project. The Cummins engines identified previously are considered representative of the engines to be secured for the construction and commissioning activity.

All generator emissions are based on emission factors provided in USEPA's AP-42 Compilation of Air Pollutant Emission Factors, Section 3.4. The following tables were used to calculation emissions:

- Table 3.4-1 for criteria pollutants (NO_x, CO, SO_2, PM, and VOC)
- Table 3.4-3 for hazardous air pollutants.
- Table 3.4-4 for polycyclic aromatic hydrocarbons.

Table 3-1 includes the total emissions from diesel generators for each location. Detailed supporting calculations are provided in Appendix A.

Table 3-1. Summary of Potential Emissions from Diesel Generators

Pollutant	East Substation / Laydown		West Substation		West Laydown	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
CO	47.91	11.98	44.22	11.06	3.69	0.92
NO_x	209.04	52.26	192.96	48.24	16.08	4.02
PM	6.1	1.53	5.63	1.41	0.47	0.12
PM_{10}	6.1	1.53	5.63	1.41	0.47	0.12
$PM_{2.5}$	6.1	1.53	5.63	1.41	0.47	0.12
SO_2	0.11	0.03	0.10	0.02	0.01	0.00
VOC	6.14	1.54	5.67	1.42	0.47	0.12
Pb	0.00	0.00	0.00	0.00	0.00	0.00
Total HAP	0.091	0.398	0.084	0.368	0.007	0.0306

lb/hr = pound per hour; tpy = ton per year

3.2 CBP EMISSIONS

Concrete batching emissions are calculated depending on the sources and the type of activity. Particulate matter, consisting of aggregate, sand, cement, and cement supplement particles, is the primary pollutant of concern.

Emissions of PM, PM_{10}, and $PM_{2.5}$, at the CBP are based on emission factors provided in USEPA's AP-42 Compilation of Air Pollutant Emission Factors, 11.12 (USEPA, 2006a), 11.19.2 (USEPA, 2004b), and 13.2.4 (USEPA, 2006b), 13.2.1 for paved roads (USEPA, 2011b), 13.2.2 for unpaved surfaces (USEPA, 2006b), and USEPA's report, *Control of Open Fugitive Dust Sources* (USEPA, 1988) for wind erosion of active storage piles.

For the purposes of calculating 1-hour potential emissions for dispersion modeling, the maximum hourly concrete production rate is assumed to be 330 tons/hour since that is the largest potential operating capacity for a CBP of the scale anticipated to be contracted by the Project. This value is used as the maximum hourly concrete production rate for each of the west and east locations.

The maximum daily concrete production rate is 1,423 tons/day and is based on the amount of concrete required on the most active construction day including contingency. This value is used as the maximum daily concrete production rate for each of the west and east locations for calculation of 24-hour potential emissions for dispersion modeling.

The total concrete production for each phase's entire 4-month duration of construction is expected to be 141,608 tons per year (tpy) and 198,925 tpy for the west and east locations, respectively. These values are used for calculation of long-term potential emissions for dispersion modeling.

3.2.1 Sand and Aggregate Delivery and Transfer

Sand and aggregate materials are brought in via trucks and delivered to an open storage area located on the ground. The materials are transferred by front-end loader to hoppers which load the materials onto a conveyor that in turn transfers them to an elevated storage area. The AP-42 Section 13.2.4.3 Predictive Emission Factor Equation is used to calculate emission factors instead of using emission factors in Table Section 11.12-5 because the former provides a more accurate representation specific to this batching process:

$$E = k(0.0032) \times \frac{(\frac{U}{5})^{1.3}}{(\frac{M}{2})^{1.4}}$$

Where E = PM emission factor;
k = particle size multiplier;
U = wind speed at the material drop point in miles per hour; and
M = minimum moisture percentage of cement;

The emission factors are multiplied by the maximum throughput of the sand and aggregate. The material handling emissions for sand and aggregate are controlled by the use of water sprays and covered conveyors. Table 3-2 summarizes estimated potential particulate emissions from sand and aggregate delivery and transfer. Detailed supporting calculations are provided in Appendix A.

Table 3-2. Summary of Potential Emissions from Sand and Aggregate Delivery and Transfer

	East Laydown		West Laydown	
Pollutant	Sand and Aggregate Transfer (lb/hr)	Sand and Aggregate Transfer (tpy)	Sand and Aggregate Transfer (lb/hr)	Sand and Aggregate Transfer (tpy)
PM	0.13	0.21	0.13	0.15
PM_{10}	0.06	0.10	0.06	0.07
$PM_{2.5}$	0.01	0.01	0.01	0.01
lb/hr = pound per hour; tpy = ton per year				

3.2.2 Cement Delivery and Weigh Hopper Loading

Cement and cement supplements are brought in via trucks and delivered to a bucket elevator or pneumatic conveyor belt that transfers the content to an elevated silo. They are then fed into a weigh hopper along with sand and aggregate.

The emission factors from AP-42 11.12-3 and 11.12-5 are multiplied by the maximum throughput of the cement and cement supplement. Material handling emissions of cement silo and cement supplement silo loading are controlled by a bin vent filter with a 98 percent control efficiency on the top of the silo. Table 3-3 and Table 3-4 summarize estimated potential particulate emissions from cement and supplement delivery and weigh hopper loading.

Table 3-3. Summary of Potential Emissions from Cement and Supplement Delivery

	East Laydown		West Laydown	
Pollutant	Cement Delivery (lb/hr)	Cement Delivery (tpy)	Cement Delivery (lb/hr)	Cement Delivery (tpy)
PM	0.000296	0.000498	0.000296	0.000354
PM_{10}	0.000178	0.000298	0.000178	0.000212
$PM_{2.5}$	0.0000267	0.000045	0.0000267	0.0000319
lb/hr = pound per hour; tpy = ton per year				

Table 3-4. Summary of Potential Emissions from Weigh Hopper Loading

Pollutant	East Laydown		West Laydown	
	Paved Roads (lb/hr)	Paved Roads (tpy)	Paved Roads (lb/hr)	Paved Roads (tpy)
PM	0.23	0.39	0.23	0.28
PM_{10}	0.11	0.19	0.11	0.14
$PM_{2.5}$	0.02	0.03	0.02	0.02
lb/hr = pound per hour; tpy = ton per year				

3.2.3 Truck Mix Loading

The materials in the weigh hopper are then mixed with water and gravity fed into the mixer trucks. The equations from AP-42 Section 11.12 and Tables 11.12-3 and 11.12-4 were used to calculate the PM emission factors.

$$E = k(0.0032) \times \frac{(U)^a}{(M)^b} + c$$

Where E = PM emission factor;
k = particle size multiplier;
U = wind speed at the material drop point in miles per hour;
M = minimum moisture percentage of cement;
a, b = exponents; and
c = constant.

The emission factors are multiplied by the maximum throughput of the mixed materials. A control efficiency of 94 percent was applied. Table 3-5 summarizes estimated potential emissions of fugitive dust from truck mix loading. Detailed supporting calculations are provided in Appendix A.

Table 3-5. Summary of Potential Fugitive Dust Emission Rates from Truck Mix Loading

Pollutant	East Laydown		West Laydown	
	Truck Loading (lb/hr)	Truck Loading (tpy)	Truck Loading (lb/hr)	Truck Loading (tpy)
PM	0.41	0.69	0.41	0.49
PM_{10}	0.16	0.28	0.16	0.20
$PM_{2.5}$	0.02	0.04	0.02	0.03
lb/hr = pound per hour; tpy = ton per year				

3.2.4 Paved Roads

Paved roads will be constructed at the CBP site for trucks delivering raw materials and hauling out concrete. For paved roads, two equations from AP-42 Section 13.2.1 were used to calculate short-term and long-term PM emission factors.

For short-term emissions calculations (24-hour duration or less) (Equation 1):

$$E = k(sL)^{0.91} \times (W)^{1.02}$$

Where E = PM emission factor;
k = particle size multiplier;
sL = road silt surface loading; and
W = average weight of the vehicles traveling the road.

For long-term emissions calculations (Equation 2):

$$E = [k(sL)^{0.91} \times (W)^{1.02}](1 - \frac{P}{4N})$$

Where E = PM emission factor;
k = particle size multiplier;
sL = road silt surface loading;
W = average weight of the vehicles traveling the road;
P = number of wet days with at least 0.01 inches of precipitation in the averaging period; and
N = number of days in the averaging period.

Table 3-6 provides the parameter values used in the paved road calculations.

Trucks delivering raw materials to the CBP and hauling concrete away from the CBP will use the haul road loop constructed within the laydown area. Details on the truck weight calculation are provided in Appendix A.

Table 3-6. Paved Road Emission Factor Parameters

Parameter	Value	Basis
k (PM)	0.011	AP-42, Section 13.2.1
k (PM_{10})	0.0022	AP-42, Section 13.2.1
k ($PM_{2.5}$)	0.00054	AP-42, Section 13.2.1
sL	12 g/m^2	AP-42, Section 13.2.1
W	20 tons	Average Vehicle Weight
P	77 days	National Climatic Data Center (NCDC), Pasco Tri-Cities Airport, 1991-2020
N	365 days	Days per year

Table 3-7 provides the number of daily trips for each of the truck purposes, as well as the trip length for each. Additional calculations are provided in Appendix A.

Table 3-7. Truck Trips

Pollutant	East Laydown		West Laydown	
	Trip Length	Daily Trips	Trip Length	Daily Trips
Sand & Aggregate Delivery	874feet	43	874 feet	43
Cement & Supplement Delivery	874 feet	3	874 feet	3
Concrete Haul Out	874 feet	71	874 feet	71

The emission factors are multiplied by the calculated distance traveled by the trucks to estimate the PM emissions from the paved roads. A control efficiency of 80 percent was applied to account for the BMPs described previously in Section 2.2.4 per the Western Regional Air Partnership's (WRAP) Fugitive Dust Handbook (WRAP, 2006). Table 3-8 summarizes estimated maximum short-term (lb/hr) and long-term (tpy) potential emissions of fugitive dust from the paved roads. Detailed supporting calculations are provided in Appendix A.

Table 3-8. Summary of Potential Fugitive Dust Emission Rates from Paved Roads

Pollutant	East Laydown		West Laydown	
	Paved Roads (lb/hr)	Paved Roads (tpy)	Paved Roads (lb/hr)	Paved Roads (tpy)
PM	3.63	5.77	3.63	4.11
PM_{10}	0.07	0.58	0.07	0.41
$PM_{2.5}$	0.02	0.14	0.02	0.10
lb/hr = pound per hour; tpy = ton per year				

3.2.5 Unpaved Roads

Vehicles as represented by a front-end loader will be used to move aggregate between storage areas and operations. They will traverse unpaved surfaces while distributing materials. For unpaved surfaces, two equations from AP-42 Section 13.2.2 were used to calculate short-term and long-term PM emission factors.

For short-term emissions calculations (24-hour duration or less) (Equation 1a):

$$E = k\left(\frac{s}{12}\right)^a \times \left(\frac{W}{3}\right)^b$$

Where E = PM emission factor;
k = particle size multiplier;
s = surface material silt content; and
W = average weight of the vehicles traversing the surface.

For long-term emissions calculations (Equation 2):

$$E = k\left(\frac{s}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times \left(\frac{365 - P}{365}\right)$$

Where E = PM emission factor;
k = particle size multiplier;
sL = surface material silt content;
W = average weight of the vehicles traversing the surface; and
P = number of wet days with at least 0.01 inches of precipitation in the averaging period.

Table 3-9 provides the parameter values used in the unpaved surfaces calculations.

Table 3-9. Unpaved Surfaces Emission Factor Parameters

Parameter	Value	Basis
k (PM)	4.9	AP-42, Section 13.2.2
k (PM_{10})	1.5	AP-42, Section 13.2.2
k ($PM_{2.5}$)	0.15	AP-42, Section 13.2.2
a (PM)	0.7	AP-42, Section 13.2.2
a (PM_{10})	0.9	AP-42, Section 13.2.2
a ($PM_{2.5}$)	0.9	AP-42, Section 13.2.2
b	0.45	AP-42, Section 13.2.2
s	4.8%	AP-42, Section 13.2.2
W	20 tons	Average Loader Weight
P	77 days	National Climatic Data Center (NCDC), Pasco Tri-Cities Airport, 1991-2020

The calculated emission factors are multiplied by the total distance traveled by the front-end loaders to calculate the PM emissions from the unpaved surfaces. The total distance is estimated based on trip lengths of 413 feet multiplied by the number of trips during the appropriate period (56 per hour maximum, 325 per day maximum). A control efficiency of 80 percent was applied to account for the BMPs described previously in Section 2.2.4 per the WRAP's Fugitive Dust Handbook (WRAP, 2006). Table 3-10 summarizes estimated maximum short-term (lb/hr) and long-term (tpy) potential emissions of fugitive dust from the unpaved surfaces. Detailed supporting calculations are provided in Appendix A. Additional calculations are provided in Appendix A.

Table 3-10. Summary of Potential Fugitive Dust Emission Rates from Unpaved Surfaces

Pollutant	East Laydown		West Laydown	
	Unpaved Roads (lb/hr)	Unpaved Roads (tpy)	Unpaved Roads (lb/hr)	Unpaved Roads (tpy)
PM	0.96	1.26	0.96	1.26
PM_{10}	0.24	0.32	0.24	0.32
$PM_{2.5}$	0.02	0.03	0.02	0.03
lb/hr = pound per hour; tpy = ton per year				

3.2.6 Wind Erosion of Storage Area

The sand and aggregate piled in the storage area on site are occasionally subject to wind gusts that can potentially produce fugitive dust emissions. For wind erosion of continuously active storage piles, an equation from USEPA's *Control of Open Fugitive Dust Sources* (USEPA, 1988) was used:

$$E = 1.7\left(\frac{s}{1.5}\right)\left(\frac{365 - P}{235}\right)\left(\frac{f}{15}\right)$$

Where E = PM emission factor;
s = silt content of aggregate;
P = number of wet days with at least 0.01 inches of precipitation per year; and
f = percentage of time that the unobstructed wind speed exceeds 5.4 m/s (12 mph).

Table 3-11 provides the parameter values used in the unpaved surfaces calculations.

Table 3-11. Wind Erosion Emission Factor Parameters

Parameter	Value	Basis
s	4.8%	AP-42, Section 13.2.2
P	77 days	National Climatic Data Center (NCDC), Pasco Tri-Cities Airport, 1991-2020
f	17.6%	Percent of Wind speed greater than 12 mph according to local meteorological data in the Horse Heaven Hills

The calculated emission factors are multiplied by the surface area of each storage pile to calculate the PM emissions from wind erosion. Each storage pile was assumed to have a diameter of 65 feet and a height of 10 feet, resulting in an average surface area of 3,472 square feet per storage pile. A control efficiency of 70 percent was applied to account for the BMPs described previously in Section 2.2.4 per the WRAP's Fugitive Dust Handbook (WRAP, 2006). Table 3-12 summarizes estimated maximum short-term (lb/hr) and long-term (tpy) potential emissions of fugitive dust resulting from wind erosion. Detailed supporting calculations are located in Appendix A.

Table 3-12. Summary of Potential Fugitive Dust Emission Rates from Wind Erosion

Pollutant	East Laydown		West Laydown	
	Wind Erosion (lb/hr)	Wind Erosion (tpy)	Wind Erosion (lb/hr)	Wind Erosion (tpy)
PM	0.000974	0.0341	0.000974	0.0341
PM_{10}	0.000487	0.0171	0.000487	0.0171
$PM_{2.5}$	0.000146	0.00512	0.000146	0.00512
lb/hr = pound per hour; tpy = ton per year				

3.3 SUMMARY OF CALCULATED POTENTIAL EMISSIONS

A summary of calculated potential emissions for the Project is provided in Table 3-13. A more detailed summary of pollutant emissions is provided in Appendix A along with detailed emission calculations.

Table 3-13. Maximum Annual Potential Emission Rates from the Project

Pollutant	East Laydown (tpy [a])	East Substation (tpy)	West Laydown (tpy)	West Substation (tpy)	Total (tpy)
CO	0.92	11.06	0.92	11.06	23.95
NO_x	4.02	48.24	4.02	48.24	104.52
PM	8.49	1.41	6.45	1.41	17.75
PM_{10}	1.60	1.41	1.27	1.41	5.68
$PM_{2.5}$	0.38	1.41	0.32	1.41	3.51
SO_2	0.002	0.02	0.002	0.02	0.05
VOC	0.12	1.42	0.12	1.42	3.07
Lead (Pb)	0.00002	0.00	0.00001	0.00	0.00003
Federal HAP	0.040	0.37	0.037	0.37	0.81
tpy = ton per year					

4.0 REGULATORY APPLICABILITY EVALUATION

This section contains an analysis of the applicability of federal and state air quality regulations to the Project. The specific regulations and programs that are included in this review include:

- Federal NSPS;
- Federal National Emissions Standards for Hazardous Air Pollutants (NESHAP); and
- BCAA permitting and emissions standards requirements.

4.1 FEDERAL EMISSIONS STANDARDS

The backup diesel generator equipment must meet the federal emissions standards stated in 40 CFR Part 60 Subpart IIII (NSPS) and 40 CFR Part 63 Subpart ZZZZ (NESHAP). The engines being considered by the Project for installation are manufacturer-certified to meet EPA Tier 2 emissions standards for stationary emergency applications.

The federal NSPS and NESHAP emissions standards do not apply to the CBP.

4.2 BENTON CLEAN AIR AGENCY PERMITTING REQUIREMENTS

All new emissions sources must be registered with the BCAA and follow the Notice of Construction (NOC) and Application for Approval process, which also serves as the registration form for the facility. BCAA approval must be received before installation of the equipment can commence. The BCAA recommends a pre-registration meeting be conducted to learn about the proposed equipment and provide guidance on how to proceed with the NOC process.

A State Environmental Policy Act (SEPA) Checklist and a Determination of Non-Significance (DNS) are required before a facility can operate. Once the DNS is in place, the NOC application is filed with the BCAA. Forms specific to emergency generator engines and portable CBPs are available on BCAA's website. The NOC application is required to include:

- Completed and signed BCAA forms;
- A set of plans that fully describes the proposed source, including distance and height of buildings within 200 feet of the source;
- The estimated emissions that will result from the proposal, or sufficient information for BCAA to calculate the expected emissions;
- The proposed means for control of emissions;
- The base fee; and
- A SEPA checklist or DNS.

The application is subject to a 30-day review period to determine completeness. If the application is deemed to be incomplete, the 30-day completeness review clock resets. Once deemed complete, the BCAA must within 60 days issue an Order of Approval which outlines the specific requirements under federal, state, and local air quality regulations that will allow the source to operate in compliance with air quality regulations.

The Project will follow the BCAA permitting procedures.

5.0 AMBIENT AIR QUALITY ANALYSIS

5.1 INTRODUCTION

An ambient air quality dispersion modeling analysis for the Project has been conducted using procedures specified in the USEPA's *Guideline on Air Quality Models* (USEPA, 2017) and based on correspondence with Washington State Department of Ecology (Ecology).

The dispersion modeling for the Project evaluates worst-case operating conditions to predict the appropriate maximum ambient air concentration for each pollutant and averaging period. The modeled cumulative impacts are added to ambient background concentrations and the sum is compared to the NAAQS. The NAAQS are established for the criteria air pollutants by the USEPA in accordance with the federal CAA to protect public health and public welfare. Section 302(h) of the CAA defines "welfare" to include effects on soils, water, crops, wildlife, weather, damage to and deterioration of property, effects on economic values, and personal comfort and well-being. Table 5-1 provides the NAAQS as well as the modeling rank basis, as defined by USEPA, used for the assessment of this Project's compliance with the various criteria.

Table 5-1. NAAQS

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$) [a]	Rank for NAAQS Assessment
$PM_{2.5}$	24-hour	35	H8H [b] (5-year Average)
	Annual	12	H1H [c] (5-year Average)
PM_{10}	24-hour	150	H6H [d] over 5 years
CO	1-hour	40,000	H2H [e]
	8-hour	10,000	H2H
NO_2	1-hour	188	H8H (5-year Average)
	Annual	100	H1H [c]
SO_2	1-hour	196	H4H [f] (5-year Average)
	3-hour	1,300	H2H
	24-hour	365	H2H
	Annual	80	H1H

[a] micrograms per cubic meter
[b] H8H = highest eighth high.
[c] H1H = highest first high.
[d] H6H = highest sixth high.
[e] H2H = highest second high.
[f] H4H = highest fourth high.

NO_X emissions from the Project sources are released primarily in the form of NO, and these emissions convert to NO_2 in the atmosphere. The NO_2 impact analysis utilized the default Tier 2 NO_X to NO_2 conversion rates (Ambient Ratio Method [ARM] and ARM2). The Tier 2 approaches assume NO_X converts to NO_2 at a rate consistent with a conservative NO_2/NO_X ambient ratio.

5.2 SOURCE DATA AND OPERATING SCENARIOS

Modeled emissions include PM emissions from all facility operations including material storage and handling as well as combustion emissions from the CBP. Emission sources and rates were identified in Section 3.

For the purposes of PM_{10} and $PM_{2.5}$ dispersion modeling, the maximum 24-hour emission rates were modeled rather than the maximum 1-hour emission rates. For CO and SO_2, the maximum 1-hour emission rates were modeled. For NO_2, consistent with guidance on the modeling of intermittent sources (USEPA, 2011a), annualized emission rates were modeled based on the assumption that each stationary engine would operate up to 500 hours per year (i.e., maximum 1-hour emission rate times 500/8760). The modeling did not impose an operational restriction on the time of day, days of the week, or months of the year. Even though emission sources will be phased and will operate intermittently, all sources were conservatively modeled as operating consistently over the entire year. Emissions released through a stack or vent were modeled as point sources. Emissions from material handling operations (drop points) were modeled as volume sources. The haul roads were modeled as line sources. The front-end loader activity and the wind erosion emissions were modeled as area sources.

Model input parameters for fugitive dust sources were based on guidance provided in the National Sand, Stone, and Gravel Association's Modeling Fugitive Dust Sources with AERMOD (NSSGA, 2007). Detailed model inputs are provided in Appendix B. Figures 5-1a. 5-1b and 5-1c show the modeled source configurations.

As mentioned previously, the project consists of two phases. Source groups were used to group activities related to each phase, and model associated emissions based on duration of each phase.

5.3 MODEL SELECTION

The most recent version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) was used in this modeling analysis. AERMOD is USEPA's preferred near-field dispersion modeling system for a wide range of regulatory applications. The AERMOD modeling system includes four regulatory components: AERMOD, AERMAP (terrain processor), AERMET (meteorological processor), and BPIP-Prime (building input processor). The current versions of AERMOD (Version 22112), AERMET (Version 22112), AERMAP (Version 18081) and BPIP-Prime (Version 04274) have been used.

5.4 METEOROLOGICAL DATA FOR AERMOD

A 5-year hourly meteorological data set was processed using AERMET to use for input to AERMOD. The processed data consists of hourly surface observations of wind speed and direction collected at the Tri-Cities Airport in Pasco, Washington and upper air data collected by the National Weather Service (NWS) in Spokane, Washington for the period 2018 through 2022. The meteorological data were collected approximately 15 miles northeast of the Project site. A wind rose plot depicting the frequencies of wind speed and direction for this meteorological data set is provided in Figure 5-2 (the wind rose depicts the direction from which the wind is blowing).

5.5 LAND USE

A land use determination has been made following the classification technique suggested by Auer in accordance with USEPA modeling guidance. The classification determination was conducted by assessing land use categories within a 3-kilometer (km) radius of the Project Site. Review of the 3-km area indicates that the area within the 3-km radius can be characterized as rural. Therefore, rural dispersion coefficients were used in the air quality modeling analysis.

5.6 GOOD ENGINEERING PRACTICE STACK HEIGHT ANALYSIS

A Good Engineering Practice (GEP) stack height analysis has been performed based on the Project structures to determine the potential for building-induced aerodynamic downwash for the proposed stacks. The analysis procedures described in USEPA's Guidelines for Determination of Good Engineering Practice Stack Height (USEPA 1985) have been used.

The "GEP stack height" is defined as the greater of 65 meters or the formula height. The "formula height" is based on the observed phenomena of disturbed atmospheric flow in the immediate vicinity of a structure resulting in higher ground-level concentrations at a closer proximity than would otherwise occur. It identifies the minimum stack height at which significant aerodynamic downwash is avoided.

The GEP formula stack height, as defined by USEPA in the 1985 final regulation, is calculated as follows:

$$H_{GEP} = H_{BLDG} + 1.5L$$

Where:

- H_{GEP} is the calculated GEP formula height;
- H_{BLDG} is the height of the nearby structure; and
- L is the lesser dimension (height or projected width) of the nearby structure.

Both the height and width of the structure are determined from the frontal area of the structure projected onto the plane perpendicular to the direction of the wind. The GEP stack height is based on the plane projection of any structure that results in the greatest calculated height. For the purpose of the GEP analysis, nearby refers to the "sphere of influence" defined as 5 times L (the lesser dimension – height or projected width – of the nearby structure), downwind from the trailing edge of the structure.

The USEPA's Building Profile Input Program (BPIP-Prime, v04274) that is appropriate for use with the PRIME algorithms in AERMOD has been used. The building dimensions and coordinates for each potentially influencing structure were input to BPIP-Prime to determine direction-specific building dimension data for input to AERMOD.

The exhaust emissions of the stacks below their calculated GEP heights will experience the aerodynamic effects of downwash. For each stack the controlling structures can differ by wind direction, and wind-direction specific building dimensions are generated by BPIP-Prime for input to AERMOD. AERMOD then accounts for potential downwash from nearby structures in the dispersion calculations. The PRIME algorithms in AERMOD calculate the dimensions of the structure's wake, from the cavity immediately downwind of the structure to the far wake.

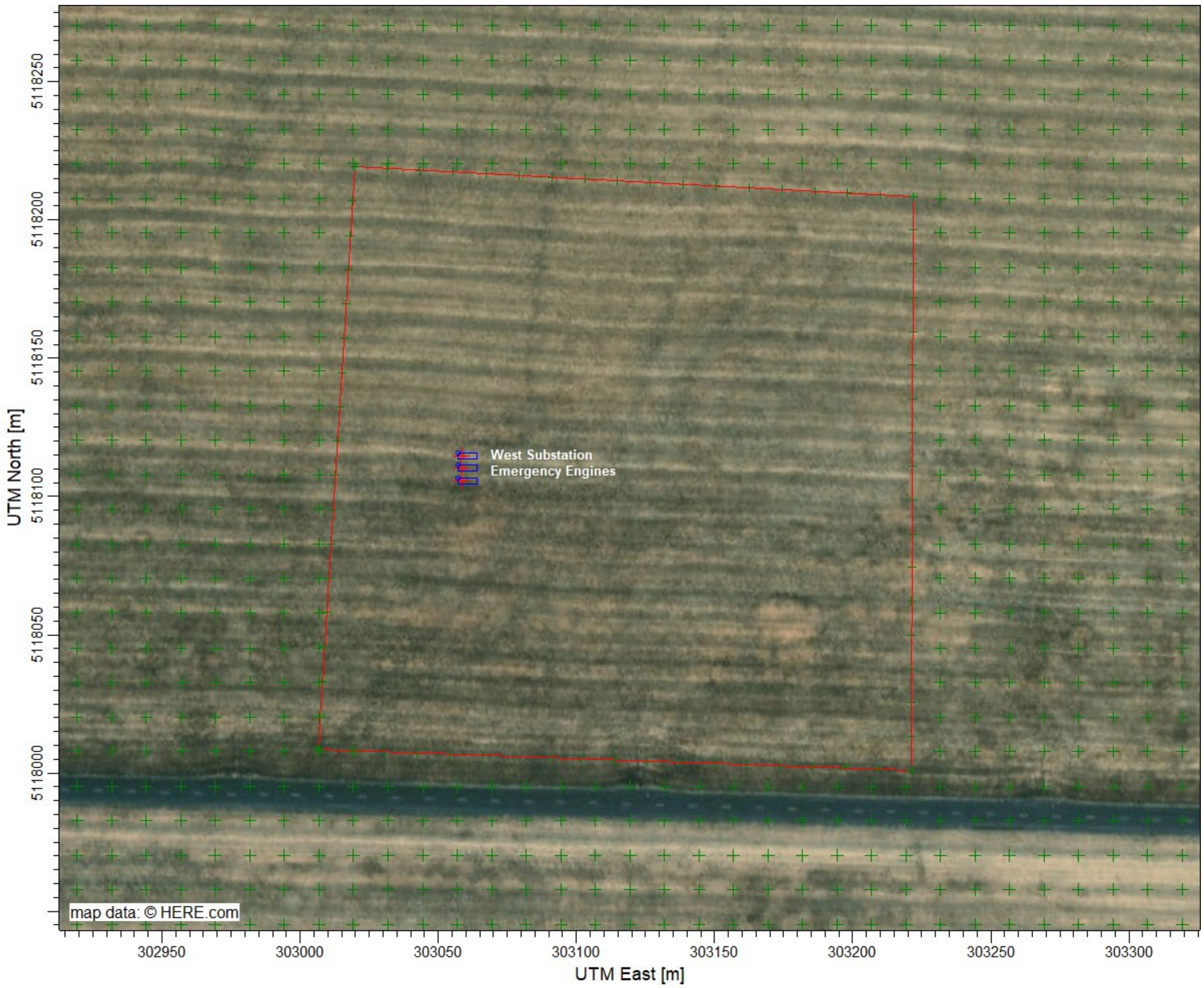

Figure 5-1a. Modeled Source Configuration: West Substation

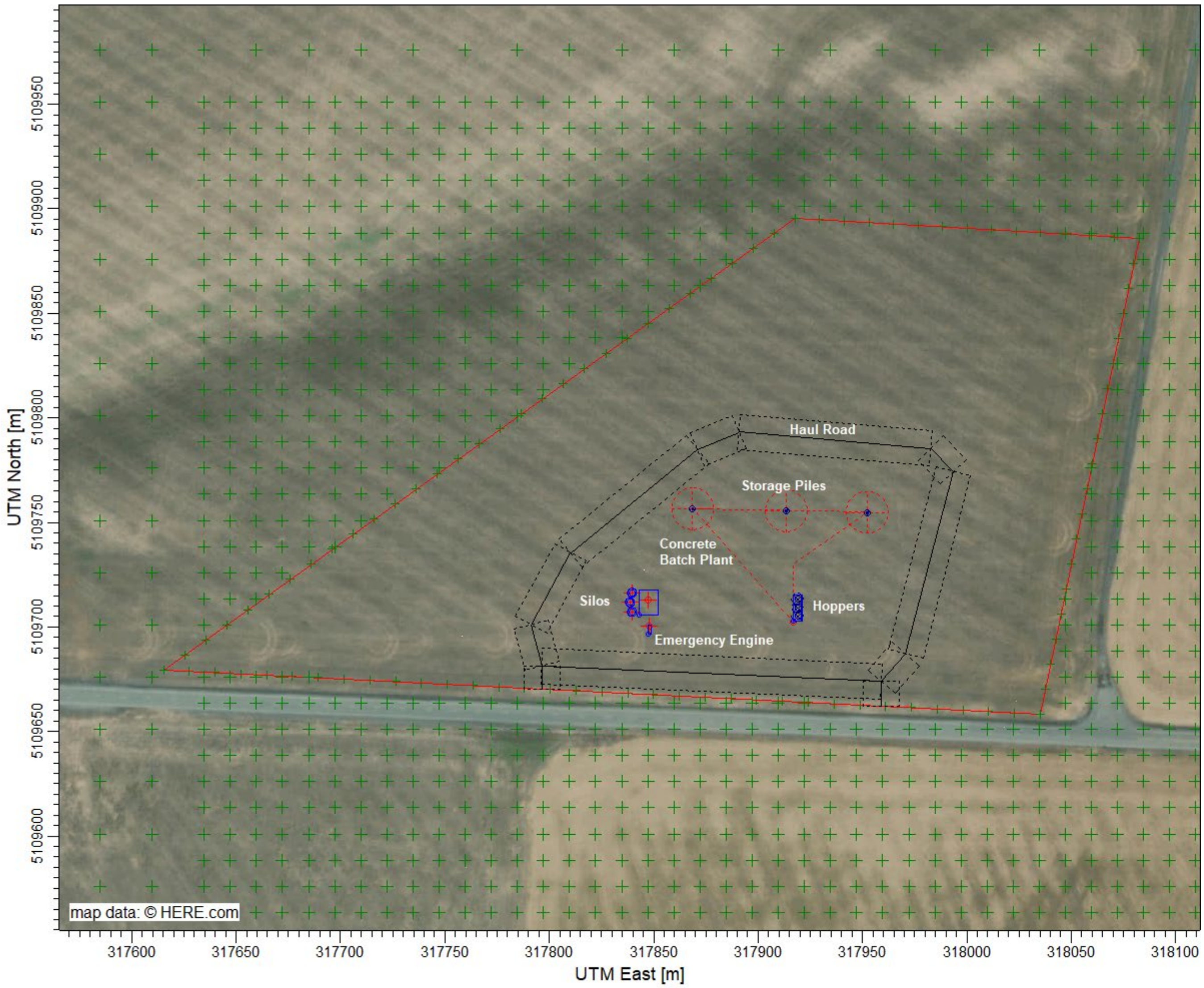

Figure 5-1b. Modeled Source Configuration: West Laydown

Figure 5-1c. Modeled Source Configuration: East Substation and Laydown

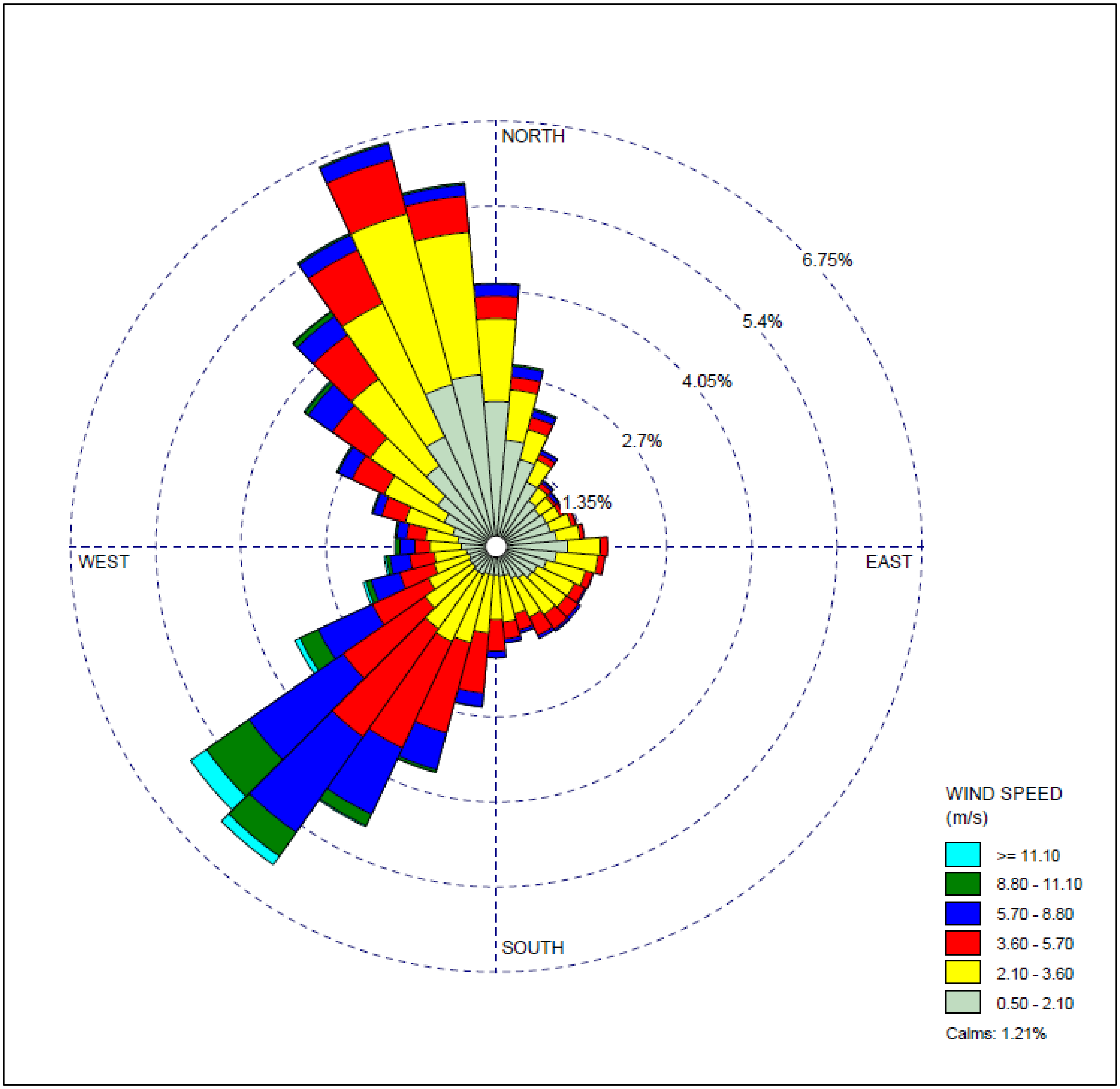

Figure 5-2. Five-Year (2018-2022) Wind Rose of Measurements from Tri-Cities Airport in Pasco, WA

5.7 RECEPTOR GRID AND AERMAP PROCESSING

Discrete receptors are placed at intervals of 12.5 meters along the Project fence line. A nested Cartesian grid was extended out from the fence line at the following receptor intervals and distances:

- At 12.5-meter intervals from the Project Site fence line to 150 meters;
- At 25-meter intervals from 150 meters to 400 meters;
- At 50-meter intervals from 400 meters to 900 meters;
- At 100-meter intervals from 900 meters to 2,000 meters;
- At 300-meter intervals from 2,000 to 4,500 meters; and
- At 600-meter intervals at from 4,500 to 10,000 meters.

Receptor elevations were assigned by using USEPA's AERMAP software tool (version 18081; USEPA, 2018), which is designed to extract elevations from the U.S. Geological Survey (USGS) Digital Elevation Model (DEM) files and USGS National Elevation Dataset (NED) files. AERMAP is the terrain preprocessor for AERMOD and uses the following procedure to assign elevations to a receptor:

- For each receptor, the program searches through the USGS input files to determine the two profiles (longitudes or eastings) that straddle this receptor.
- For each of these two profiles, the program then searches through the nodes in the USGS input files to determine which two rows (latitudes or northings) straddle the receptor.
- The program then calculates the coordinates of these four points and reads the elevations for these four points.
- A 2-dimensional distance-weighted interpolation is used to determine the elevation at the receptor location based on the elevations at the four nodes determined above.

NED data with a resolution of 1/3 arc-second (roughly 10 meters) were used as inputs to AERMAP. The NED data domain was sufficient to properly account for terrain that would factor into the critical hill height calculations. Receptor elevations generated by AERMAP were then visually confirmed with the actual USGS 7.5-minute topographic maps to ensure accurate representation of terrain features. Based on guidance from Ecology, flagpole receptor heights were set to 1.5 meters above ground. Figure 5-3 shows the receptors included in the modeling analysis.

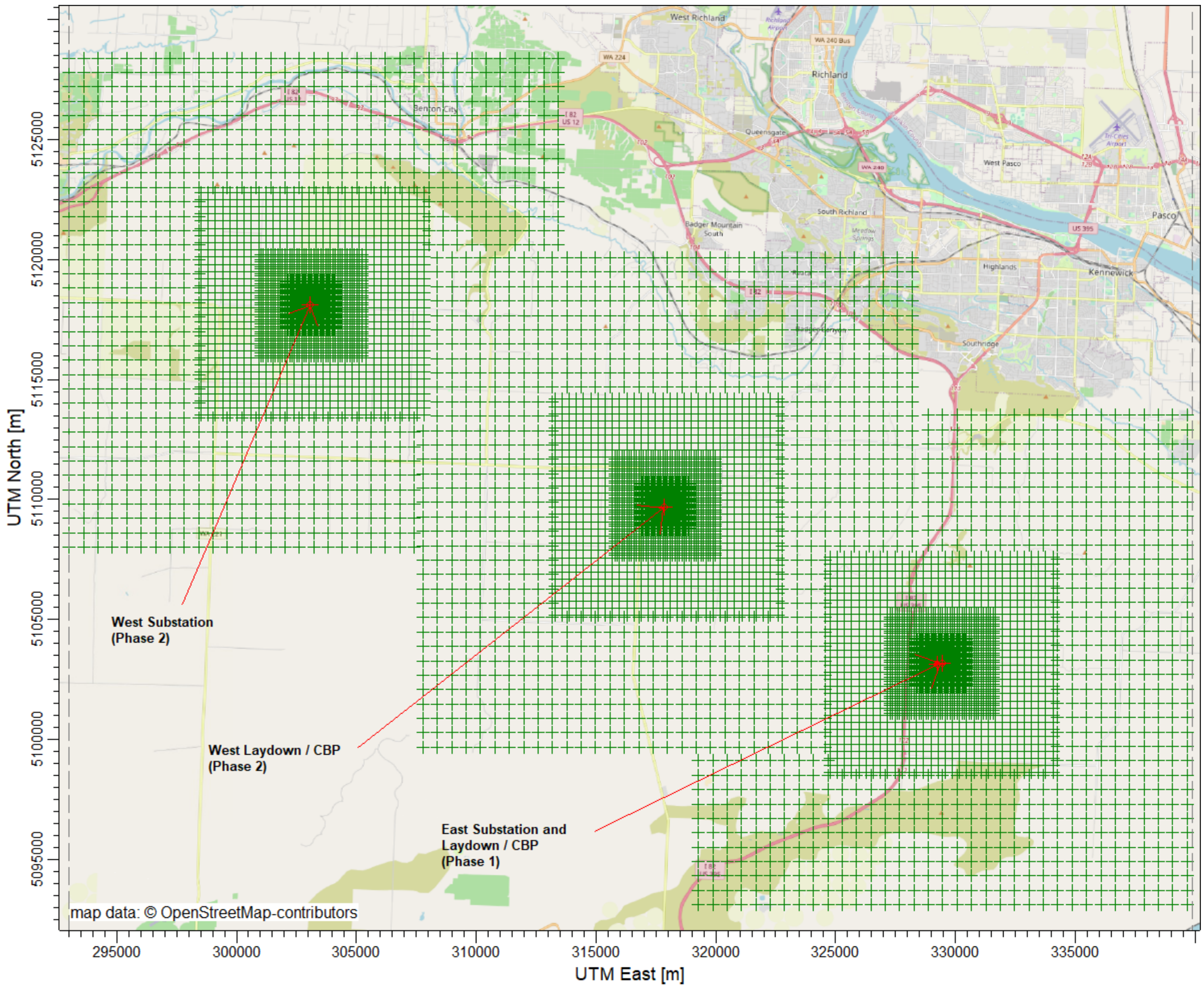

Figure 5-3. Modeled Receptor Grids

5.8 AMBIENT BACKGROUND DATA

Per guidance from Ecology, data from the NW-AIRQUEST tool was used to determine ambient background concentrations for use in the air quality analysis. In collaboration between Ecology, the Idaho Department of Environmental Quality, and the Oregon Department of Environmental Quality, the tool was created using model and monitoring data from 2014 through 2017 to estimate background concentrations of criteria air pollutant design values at user-specified locations in Washington, Idaho, and Oregon (IDEQ 2019). A location near the center of the modeled emissions sources was specified and representative criteria pollutant design values were provided. The representative ambient air quality background concentrations are provided in Table 5-2.

Table 5-2. Ambient Background Air Quality Concentrations

Pollutant	Averaging Period	Rank	Background Concentration (µg/m³)	NAAQS (µg/m³)	Ambient Background % of NAAQS
$PM_{2.5}$	24-hour	98th percentile	17.5	35	50%
	Annual	Mean	5.7	12	48%
PM_{10}	24-hour	2nd high	71.6	150	48%
CO	1-hour	2nd high	1,386	40,000	3%
	8-hour	2nd high	962	10,000	10%
NO_2	1-hour	98th percentile	19.0	188	10%
	Annual	Mean	3.8	100	4%
SO_2	1-hour	2nd high	12.8	196	7%
	3-hour	2nd high	17.0	1,300	1%
	24-hour	2nd high	5.8	365	2%
	Annual	Mean	1.0	80	1%

Notes:
Monitor located at 46.130541°, -119.381191°
Source: https://idahodeq.maps.arcgis.com/apps/MapSeries/index.html?appid=0c8a006e11fe4ec5939804b873098dfe

5.9 MODELING RESULTS

The modeling analyses were conducted using the most current version of AERMOD (Version 22112) along with the meteorological data as described in Section 5.4. The analyses were conducted to demonstrate compliance with the NAAQS. All Project emissions sources were assumed to be operating at maximum potential emission rates to assess compliance with the NAAQS. The modeled results for the Project are summarized in Table 5-3 for all pollutants modeled. Representative background concentrations were added to modeled impacts and the total concentrations were then compared to the NAAQS. As shown in Table 5-3, emissions from the Project will not cause or contribute to a violation of the NAAQS.

The modeling of fugitive dust emissions is known to over-predict ambient PM_{10} and $PM_{2.5}$ concentrations, such that the predictions presented here should be regarded as conservative overestimates of ambient air quality impacts. AERMOD does not account for the episodic (non-continuous) nature of fugitive dust emissions sources, does not properly address near-source plume depletion, and does not consider the removal of dust in plumes by trees, berms, and other obstacles. Cowherd (2009) identified deficiencies with model representation of fugitive dust sources, and assigned factors of overestimation to the deficiencies:

- Misrepresentation of haul roads as continuously emitting sources, factor of 2 overestimation;
- Cumulative effects of modeling deficiencies, factor of 4 overestimation for “average” groundcover;
- Exclusion of near-source agglomeration and enhanced deposition, up to a factor of 6 overestimation, depending on wind and groundcover; and
- Exclusion of trapping by vertical obstacles during horizontal transport, factor of 2 to 6 overestimation, depending on wind and groundcover;

Given these deficiencies, the worst-case ambient concentrations of PM_{10} and $PM_{2.5}$ resulting from the Project are expected to be considerably less than those presented in Table 5-3. Additionally, due to the broad spatial and temporal distribution of construction activities (i.e., construction activities across the Project will be spread over an expansive area and will likely not occur simultaneously), emissions from the generators and CBP are not expected to interact with the balance of construction activities in a way that would cause or contribute to a violation of the NAAQS.

Figures in Appendix C illustrate the extents of maximum predicted pollutant concentrations relative to the whole Project area and surrounding residences for $PM_{2.5}$ (24-hour and Annual), PM_{10} (24-hour), and NO_2 (1-hour). Figures show areas where design value concentrations with ambient background are predicted to take up more than 50% of the NAAQS. For 24-hour $PM_{2.5}$, since ambient background concentrations already take up 50% of the NAAQS, figures show areas where total concentrations are predicted to take up 55% of the NAAQS. For 1-hour NO_2, areas where total concentrations take up 50% of the NAAQS are limited, and therefore are only shown in the near-field relative to surrounding residences. The figures show that predicted maximum pollutant concentrations, inclusive of a number of conservative assumptions, are highly localized and drop rapidly with distance from the sources. The figures also show that the emissions modeled are not expected to cause violations at the nearest residential receptors.

Table 5-3. Maximum AERMOD-Predicted Concentrations and NAAQS Compliance Assessment

Pollutant	Averaging Period	Rank Basis	Predicted Project Concentration ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
$PM_{2.5}$	24-hour	H8H (5-year Average)	16.9	17.5	34	35
	Annual	H1H (5-year Average)	4.2	5.7	10	12
PM_{10}	24-Hour	H6H (5-year Duration)	59.8	71.6	131	150
CO	1-hour	H2H	624.9	1,386	2,011	40,000
	8-hour	H2H	445.3	962	1,407	10,000
NO_2	1-hour	H8H (5-year Average)	105.6	19.0	125	188
	Annual	H1H	6.9	3.8	11	100
SO_2	1-hour	H4H (5-year Average)	1.1	12.8	14	196
	3-hour	H2H	1.3	17.0	18	1,300
	24-hour	H2H	0.6	5.8	6	365
	Annual	H1H	0.07	1.0	1	80
$\mu g/m^3$ = microgram per cubic meter						

6.0 REFERENCES

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APPENDIX A: EMISSIONS CALCULATIONS

	Location	Substation Location	Equipment Type	Units	Criteria Pollutants							
					CO	NOx	PM	PM_{10}	$PM_{2.5}$	SO_2	VOC	Lead
Uncontrolled	Location 1	East Substation	East Load Bank Engines	(lb/hr)	44.22	192.96	5.63	5.63	5.63	0.10	5.67	-
				(tpy)	11.06	48.24	1.41	1.41	1.41	0.02	1.42	-
		East Laydown	East CBP Engine	(lb/hr)	3.69	16.08	0.47	0.47	0.47	0.01	0.47	-
				(tpy)	0.92	4.02	0.12	0.12	0.12	0.00	0.12	-
			East CBP Mat'l Handling	(lb/hr)	-	-	181.87	24.27	3.66	-	-	0.01
				(tpy)	-	-	51.61	6.90	1.07	-	-	0.00
	Location 2	West Substation	West Load Bank Engines	(lb/hr)	44.22	192.96	5.63	5.63	5.63	0.10	5.67	-
				(tpy)	11.06	48.24	1.41	1.41	1.41	0.02	1.42	-
	Location 3	West Laydown	West CBP Engine	(lb/hr)	3.69	16.08	0.47	0.47	0.47	0.01	0.47	-
				(tpy)	0.92	4.02	0.12	0.12	0.12	0.00	0.12	-
			West CBP Mat'l Handling	(lb/hr)	-	-	181.87	24.27	3.66	-	-	0.01
				(tpy)	-	-	38.59	5.39	0.81	-	-	0.00
			Total:	**(lb/hr)**	**95.81**	**418.08**	**375.94**	**60.73**	**19.52**	**0.21**	**12.28**	**0.02**
				(tpy)	**23.95**	**104.52**	**93.25**	**15.34**	**4.93**	**0.05**	**3.07**	**0.01**
Controlled	Location 1	East Substation	East Load Bank Engines	(lb/hr)	44.22	192.96	5.63	5.63	5.63	0.10	5.67	-
				(tpy)	11.06	48.24	1.41	1.41	1.41	0.02	1.42	-
		East Laydown	East CBP Engine	(lb/hr)	3.69	16.08	0.47	0.47	0.47	0.01	0.47	-
				(tpy)	0.92	4.02	0.12	0.12	0.12	0.00	0.12	-
			East CBP Mat'l Handling	(lb/hr)	-	-	5.36	0.65	0.09	-	-	0.00
				(tpy)	-	-	8.37	1.48	0.26	-	-	0.00
	Location 2	West Substation	West Load Bank Engines	(lb/hr)	44.22	192.96	5.63	5.63	5.63	0.10	5.67	-
				(tpy)	11.06	48.24	1.41	1.41	1.41	0.02	1.42	-
	Location 3	West Laydown	West CBP Engine	(lb/hr)	3.69	16.08	0.47	0.47	0.47	0.01	0.47	-
				(tpy)	0.92	4.02	0.12	0.12	0.12	0.00	0.12	-
			West CBP Mat'l Handling	(lb/hr)	-	-	5.36	0.65	0.09	-	-	0.00
				(tpy)	-	-	6.33	1.15	0.20	-	-	0.00
			Total:	**(lb/hr)**	**95.81**	**418.08**	**22.91**	**13.50**	**12.38**	**0.21**	**12.28**	**0.01**
				(tpy)	**23.95**	**104.52**	**17.75**	**5.68**	**3.51**	**0.05**	**3.07**	**0.00**

	Location	Substation Location	Equipment Type	Units	Hazardous Air Pollutants																	
					Acetaldehyde	**Acrolein**	**Arsenic**	**Benzene**	**Beryllium**	**Cadmium**	**Total Chromium**	**Formaldehyde**	**Lead**	**Manganese**	**Naphthalene**	**Nickel**	**Total Phosphorus**	**Selenium**	**Toluene**	**Xylenes**	**Total PAH**	**Total HAPs**
Uncontrolled	Location 1	East Substation	East Load Bank Engines	(lb/hr)	1.42E-03	4.43E-04	-	4.37E-02	-	-	-	4.44E-03	0.00E+00	-	7.32E-03	-	-	-	1.58E-02	1.09E-02	1.19E-02	8.40E-02
				(tpy)	6.21E-03	1.94E-03	-	1.91E-01	-	-	-	1.94E-02	0.00E+00	-	3.20E-02	-	-	-	6.93E-02	4.76E-02	5.23E-02	3.68E-01
		East Laydown	East CBP Engine	(lb/hr)	1.18E-04	3.70E-05	-	3.64E-03	-	-	-	3.70E-04	0.00E+00	-	6.10E-04	-	-	-	1.32E-03	9.05E-04	9.94E-04	7.00E-03
				(tpy)	5.18E-04	1.62E-04	-	1.59E-02	-	-	-	1.62E-03	0.00E+00	-	2.67E-03	-	-	-	5.77E-03	3.96E-03	4.35E-03	3.06E-02
			East CBP Mat'l Handling	(lb/hr)	-	-	2.11E-02	-	1.58E-03	9.18E-05	2.40E-02	-	1.00E-02	9.11E-02	-	4.74E-02	7.50E-02	2.06E-03	-	-	-	2.72E-01
				(tpy)	-	-	6.35E-03	-	4.76E-04	2.77E-05	7.23E-03	-	3.02E-03	2.75E-02	-	1.43E-02	2.26E-02	6.21E-04	-	-	-	8.20E-02
	Location 2	West Substation	West Load Bank Engines	(lb/hr)	1.42E-03	4.43E-04	-	4.37E-02	-	-	-	4.44E-03	0.00E+00	-	7.32E-03	-	-	-	1.58E-02	1.09E-02	1.19E-02	8.40E-02
				(tpy)	6.21E-03	1.94E-03	-	1.91E-01	-	-	-	1.94E-02	0.00E+00	-	3.20E-02	-	-	-	6.93E-02	4.76E-02	5.23E-02	3.68E-01
	Location 3	West Laydown	West CBP Engine	(lb/hr)	1.18E-04	3.70E-05	-	3.64E-03	-	-	-	3.70E-04	0.00E+00	-	6.10E-04	-	-	-	1.32E-03	9.05E-04	9.94E-04	7.00E-03
				(tpy)	5.18E-04	1.62E-04	-	1.59E-02	-	-	-	1.62E-03	0.00E+00	-	2.67E-03	-	-	-	5.77E-03	3.96E-03	4.35E-03	3.06E-02
			West CBP Mat'l Handling	(lb/hr)	-	-	2.11E-02	-	1.58E-03	9.18E-05	2.40E-02	-	1.00E-02	9.11E-02	-	4.74E-02	7.50E-02	2.06E-03	-	-	-	2.72E-01
				(tpy)	-	-	4.52E-03	-	3.39E-04	1.97E-05	5.14E-03	-	2.15E-03	1.95E-02	-	1.02E-02	1.61E-02	4.42E-04	-	-	-	5.84E-02
			Total:	**(lb/hr)**	**0.00**	**0.00**	**0.04**	**0.09**	**0.00**	**0.00**	**0.05**	**0.01**	**0.02**	**0.18**	**0.02**	**0.09**	**0.15**	**0.00**	**0.03**	**0.02**	**0.03**	**0.73**
				(tpy)	**0.01**	**0.00**	**0.01**	**0.41**	**0.00**	**0.00**	**0.01**	**0.04**	**0.01**	**0.05**	**0.07**	**0.02**	**0.04**	**0.00**	**0.15**	**0.10**	**0.11**	**0.94**
Controlled	Location 1	East Substation	East Load Bank Engines	(lb/hr)	1.42E-03	4.43E-04	-	4.37E-02	-	-	-	4.44E-03	0.00E+00	-	7.32E-03	-	-	-	1.58E-02	1.09E-02	1.19E-02	0.08
				(tpy)	6.21E-03	1.94E-03	-	1.91E-01	-	-	-	1.94E-02	0.00E+00	-	3.20E-02	-	-	-	6.93E-02	4.76E-02	5.23E-02	3.68E-01
		East Laydown	East CBP Engine	(lb/hr)	1.18E-04	3.70E-05	-	3.64E-03	-	-	-	3.70E-04	0.00E+00	-	6.10E-04	-	-	-	1.32E-03	9.05E-04	9.94E-04	7.00E-03
				(tpy)	5.18E-04	1.62E-04	-	1.59E-02	-	-	-	1.62E-03	0.00E+00	-	2.67E-03	-	-	-	5.77E-03	3.96E-03	4.35E-03	3.06E-02
			East CBP Mat'l Handling	(lb/hr)	-	-	2.28E-03	-	2.77E-04	1.98E-05	7.61E-03	-	2.93E-03	3.01E-02	-	7.13E-02	2.26E-02	2.64E-04	-	-	-	1.37E-01
				(tpy)	-	-	1.60E-04	-	1.94E-05	1.39E-06	5.32E-04	-	2.05E-04	2.11E-03	-	4.99E-03	1.58E-03	1.84E-05	-	-	-	9.60E-03
	Location 2	West Substation	West Load Bank Engines	(lb/hr)	1.42E-03	4.43E-04	-	4.37E-02	-	-	-	4.44E-03	0.00E+00	-	7.32E-03	-	-	-	1.58E-02	1.09E-02	1.19E-02	8.40E-02
				(tpy)	6.21E-03	1.94E-03	-	1.91E-01	-	-	-	1.94E-02	0.00E+00	-	3.20E-02	-	-	-	6.93E-02	4.76E-02	5.23E-02	3.68E-01
	Location 3	West Laydown	West CBP Engine	(lb/hr)	1.18E-04	3.70E-05	-	3.64E-03	-	-	-	3.70E-04	0.00E+00	-	6.10E-04	-	-	-	1.32E-03	9.05E-04	9.94E-04	7.00E-03
				(tpy)	5.18E-04	1.62E-04	-	1.59E-02	-	-	-	1.62E-03	0.00E+00	-	2.67E-03	-	-	-	5.77E-03	3.96E-03	4.35E-03	3.06E-02
			West CBP Mat'l Handling	(lb/hr)	-	-	2.28E-03	-	2.77E-04	1.98E-05	7.61E-03	-	2.93E-03	3.01E-02	-	7.13E-02	2.26E-02	2.64E-04	-	-	-	1.37E-01
				(tpy)	-	-	1.14E-04	-	1.38E-05	9.87E-07	3.79E-04	-	1.46E-04	1.50E-03	-	3.55E-03	1.12E-03	1.31E-05	-	-	-	6.84E-03
			Total:	**(lb/hr)**	**0.00**	**0.00**	**0.00**	**0.09**	**0.00**	**0.00**	**0.02**	**0.01**	**0.01**	**0.06**	**0.02**	**0.14**	**0.05**	**0.00**	**0.03**	**0.02**	**0.03**	**0.46**
				(tpy)	**0.01**	**0.00**	**0.00**	**0.41**	**0.00**	**0.00**	**0.00**	**0.04**	**0.00**	**0.00**	**0.07**	**0.01**	**0.00**	**0.00**	**0.15**	**0.10**	**0.11**	**0.81**

Horse Heaven Wind Farm, LLC
Summary of Emissions

	Location	Substation Location	Equipment Type	Units	Polycyclic Aromatic Hydrocarbons																
					Acena-phthene	Acenaph-thylene	Anthracene	Benz(a)an-thracene	Benzo(a)-pyrene	Benzo(b)-fluoranthene	Benzo(g,h,l)-perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3,-d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAH
Uncontrolled	Location 1	East Substation	East Load Bank Engines	(lb/hr)	-	-	6.92E-05	-	-	-	-	1.23E-05	8.61E-05	1.95E-05	2.27E-04	7.20E-04	2.33E-05	7.32E-03	2.30E-03	2.09E-04	1.19E-02
				(tpy)	-	-	3.03E-04	-	-	-	-	5.37E-05	3.77E-04	8.53E-05	9.93E-04	3.16E-03	1.02E-04	3.20E-02	1.01E-02	9.15E-04	5.23E-02
		East Laydown	East CBP Engine	(lb/hr)	-	-	5.77E-06	-	-	-	-	1.02E-06	7.18E-06	1.62E-06	1.89E-05	6.00E-05	1.94E-06	6.10E-04	1.91E-04	1.74E-05	9.94E-04
				(tpy)	-	-	2.53E-05	-	-	-	-	4.48E-06	3.14E-05	7.11E-06	8.28E-05	2.63E-04	8.50E-06	2.67E-03	8.38E-04	7.62E-05	4.35E-03
			East CBP Mat'l Handling	(lb/hr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				(tpy)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Location 2	West Substation	West Load Bank Engines	(lb/hr)	-	-	6.92E-05	-	-	-	-	1.23E-05	8.61E-05	1.95E-05	2.27E-04	7.20E-04	2.33E-05	7.32E-03	2.30E-03	2.09E-04	1.19E-02
				(tpy)	-	-	3.03E-04	-	-	-	-	5.37E-05	3.77E-04	8.53E-05	9.93E-04	3.16E-03	1.02E-04	3.20E-02	1.01E-02	9.15E-04	5.23E-02
	Location 3	West Laydown	West CBP Engine	(lb/hr)	-	-	5.77E-06	-	-	-	-	1.02E-06	7.18E-06	1.62E-06	1.89E-05	6.00E-05	1.94E-06	6.10E-04	1.91E-04	1.74E-05	9.94E-04
				(tpy)	-	-	2.53E-05	-	-	-	-	4.48E-06	3.14E-05	7.11E-06	8.28E-05	2.63E-04	8.50E-06	2.67E-03	8.38E-04	7.62E-05	4.35E-03
			West CBP Mat'l Handling	(lb/hr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				(tpy)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total:			**(lb/hr)**	**-**	**-**	**0.00**	**-**	**-**	**-**	**-**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**	**0.03**
				(tpy)	**-**	**-**	**0.00**	**-**	**-**	**-**	**-**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**0.07**	**0.02**	**0.00**	**0.11**
Controlled	Location 1	East Substation	East Load Bank Engines	(lb/hr)	-	-	6.92E-05	-	-	-	-	1.23E-05	8.61E-05	1.95E-05	2.27E-04	7.20E-04	2.33E-05	7.32E-03	2.30E-03	2.09E-04	1.19E-02
				(tpy)	-	-	3.03E-04	-	-	-	-	5.37E-05	3.77E-04	8.53E-05	9.93E-04	3.16E-03	1.02E-04	3.20E-02	1.01E-02	9.15E-04	5.23E-02
		East Laydown	East CBP Engine	(lb/hr)	-	-	5.77E-06	-	-	-	-	1.02E-06	7.18E-06	1.62E-06	1.89E-05	6.00E-05	1.94E-06	6.10E-04	1.91E-04	1.74E-05	9.94E-04
				(tpy)	-	-	2.53E-05	-	-	-	-	4.48E-06	3.14E-05	7.11E-06	8.28E-05	2.63E-04	8.50E-06	2.67E-03	8.38E-04	7.62E-05	4.35E-03
			East CBP Mat'l Handling	(lb/hr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				(tpy)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Location 2	West Substation	West Load Bank Engines	(lb/hr)	-	-	6.92E-05	-	-	-	-	1.23E-05	8.61E-05	1.95E-05	2.27E-04	7.20E-04	2.33E-05	7.32E-03	2.30E-03	2.09E-04	1.19E-02
				(tpy)	-	-	3.03E-04	-	-	-	-	5.37E-05	3.77E-04	8.53E-05	9.93E-04	3.16E-03	1.02E-04	3.20E-02	1.01E-02	9.15E-04	5.23E-02
	Location 3	West Laydown	West CBP Engine	(lb/hr)	-	-	5.77E-06	-	-	-	-	1.02E-06	7.18E-06	1.62E-06	1.89E-05	6.00E-05	1.94E-06	6.10E-04	1.91E-04	1.74E-05	9.94E-04
				(tpy)	-	-	2.53E-05	-	-	-	-	4.48E-06	3.14E-05	7.11E-06	8.28E-05	2.63E-04	8.50E-06	2.67E-03	8.38E-04	7.62E-05	4.35E-03
			West CBP Mat'l Handling	(lb/hr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				(tpy)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total:			**(lb/hr)**	**-**	**-**	**0.00**	**-**	**-**	**-**	**-**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**	**0.03**
				(tpy)	**-**	**-**	**0.00**	**-**	**-**	**-**	**-**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**0.07**	**0.02**	**0.00**	**0.11**

	Concrete Usage and Schedule	Units	Location East	Location West	Location Total	Source
Concrete Usage	Turbine Foundation	(CY)	76,565	53,638	130,203	Estimated usage based on Scout-provided data.
	BESS Foundation	(CY)	2,045	2,045	4,090	Estimated usage based on Scout-provided data.
	Substation Foundation	(CY)	960	960	1,920	Estimated usage based on Scout-provided data.
	Concrete Usage	(CY)	79,570	56,643	136,213	Sum of all foundations.
	Percent Used by Each Location	(%)	58%	42%	100%	Calculated percentage.
	Concrete Usage (Applied Margins)	(CY)	99,463	70,804	170,266	Assume 25% increase in margin to account for uncertainty and spoiled batches.
		(ton)	198,925	141,608	340,533	
Max Operat ng Schedu e	Estimated Operating Duration	(months)	4	4	8	Estimated project timeline.
	Max Hourly Production	(CY/hr)	165	165		The operating capacity of the largest possible concrete batch plant is 165 cy/hr.
		(ton/hr)	330	330		Assume 2 tons = 1 CY of concrete.
	Max Daily Production	(CY/day)	711	711		Assume 2 tons = 1 CY of concrete.
		(ton/day)	1,423	1,423		Provided by Scout, with 25% margin to account for uncertainty and spoiled batches
	Max Annual Production	(CY/yr)	99,463	70,804	170,266	Max concrete usage per location.
		(ton/yr)	198,925	141,608	340,533	Max concrete usage per location.

	Raw Materials	Units	Processing Rate East	Processing Rate West	Source
Composition	Cement - 8%	(ton/hr)	26.4	26.4	Ratios of raw materials from Wanzek and Blattner. Cement composition is estimated to contain 8% cement and 2% cement supplement.
		(ton/day)	114	114	
		(ton/yr)	15,914	11,329	
	Cement Supplement - 2%	(ton/hr)	6.6	6.6	
		(ton/day)	28	28	
		(ton/yr)	3,979	2,832	
	Fly Ash (Light Aggregate) - 3%	(ton/hr)	9.9	9.9	
		(ton/day)	43	43	
		(ton/yr)	5,968	4,248	
	Rock (Heavy Aggregate) - 45%	(ton/hr)	149	149	
		(ton/day)	640	640	
		(ton/yr)	89,516	63,723	
	Sand - 37%	(ton/hr)	122.1	122.1	
		(ton/day)	526	526	
		(ton/yr)	73,602	52,395	
	Water - 5%	(ton/hr)	17	17	
		(ton/day)	71	71	
		(ton/yr)	9,946	7,080	

	Misc Parameters	Units	Location East	Location West	Source
Storage Pl e	Storage Pile Diameter	(ft)	65	65	Estimated size.
	Storage Pile Height	(ft)	10	10	Estimated size.
	Storage Pile Surface Area	(ft^2)	3472	3472	Cone shape storage area.
		(acre)	0.08	0.08	Square feet to acre conversion.
	Number of Storage Piles	(qty)	3	3	Estimated number of piles.
Misc	Wind Speed [U]	(mph)	6	6	Estimated average wind speed in Benton County.
	Moisture [M]	(%)	5	5	Average moisture content of sand and aggregate.

	Vehicle Parameters and Trip Lengths	Units	East: Sand & Aggregate Delivery	East: Cement Delivery	East: Concrete Haul-Out	West: Sand & Aggregate Delivery	West: Cement Delivery	West: Concrete Haul-Out
MPR	Material Processing Rate	(ton/hour)	281	26	330	281	26	330
		(ton/day)	1,209	114	1,423	1,209	114	1,423
		(ton/yr)	169,086	15,914	198,925	120,366	11,329	141,608
Truck We ght and Tr p Lengths (Paved)	Truck Trips	(trips/hour)	10	1	17	10	1	17
		(trips/day)	43	3	71	43	3	71
		(trips/yr)	6,039	442	9,946	4,299	315	7,080
	Typical Trip Length [Loaded]	(feet/trip)	395	648	227	395	648	227
	Typical Trip Length [Unloaded]	(feet/trip)	479	227	648	479	227	648
	Typical Trip Length [Total]	(feet/trip)	874	874	874	874	874	874
	Truck Full Weight	(tons)	43	54	35	43	54	35
	Truck Haul Capacity	(tons)	28	36	20	28	36	20
	Truck Empty Weight	(tons/load)	15	18	15	15	18	15
	Hourly VMT [Loaded]	(mi/hr)	0.75	0.09	0.71	0.75	0.09	0.71
	Hourly VMT [Unloaded]	(mi/hr)	0.91	0.03	2.02	0.91	0.03	2.02
	Hourly VMT [Total]	(mi/hr)	1.66	0.12	2.73	1.66	0.12	2.73
	Daily VMT [Loaded]	(mi/day)	3.23	0.39	3.05	3.23	0.39	3.05
	Daily VMT [Unloaded]	(mi/day)	3.92	0.14	8.72	3.92	0.14	8.72
	Daily VMT [Total]	(mi/day)	7.15	0.52	11.77	7.15	0.52	11.77
	Annual VMT [Loaded]	(mi/yr)	452	54	427	322	39	304
	Annual VMT [Unloaded]	(mi/yr)	548	19	1,220	390	13	868
	Annual VMT [Total]	(mi/yr)	1,000	73	1,646	712	52	1,172
Loader and Tr p Lengths (Unpaved)	Loader Full Weight	(ton)		22.5			22.5	
	Loader Empty Weight	(ton)		17.5			17.5	
	Loader Haul Capacity	(ton)		5.0			5.0	
	Loader Average Weight	(ton)		20.0			20.0	
	Loader Round Trip	(ft)		413			413	
		(mi)		0.078			0.078	

Description of Concrete Batching	Equation	Source	Coefficients											PM Emission Factors				
			U	M	k	a	b	c	f [1]	p [2]	s [3]	sL [4]	W	Pollutant	(lb/ton)	(lb/VMT)	(lb/VMT)	(lb/hr-acre)
			(mph)	(%)					(%)	(days)	(%)	(g/m^2)	(ton)		EF	Short Term EF	Long Term EF	EF
			Wind speed	Moisture content	Particle size multiplier	Exponent	Exponent	Constant	Wind speed over 12 mph	No. of wet days/yr	Silt Content	Silt Load	Vehicle Weight					
Aggregate delivery to ground storage; Sand delivery to ground storage; Aggregate transfer to conveyor; Aggregate transfer to elevated storage; Sand transfer to elevated storage	$E = k(0.0032) \times \frac{(\frac{U}{5})^{1.3}}{(\frac{M}{2})^{1.4}}$	AP-42, 13.2.4.3 Predictive Emission Factor Equation.	6	5	0.74									PM	0.00083			
			6	5	0.35									PM_{10}	0.00039			
			6	5	0.053									$PM_{2.5}$	0.00006			
Truck mix loading [Controlled]	$E = k(0.0032) \times \frac{(U)^a}{(M)^b} + c$	AP-42, Section 11.12, Equation 11.12-1.	6	5	0.8	1.75	0.3	0.013						PM	0.04933			
			6	5	0.32	1.75	0.3	0.0052						PM_{10}	0.01973			
			6	5	0.048	1.75	0.3	0.00078						$PM_{2.5}$	0.00296			
Vehicle traffic (paved roads) [Uncontrolled]	$E = [k(sL)^{0.91} \times (W)^{1.02}](1 - \frac{P}{4N})$	AP-42 Section 13.2.1. Paved Roads.	6	5	0.11					77		12	20	PM		22.41291	21.23086	
			6	5	0.0022					77		12	20	PM_{10}		0.44826	0.42462	
			6	5	0.00054					77		12	20	$PM_{2.5}$		0.11003	0.10422	
Vehicle traffic (unpaved roads) [Uncontrolled]	$E = k(\frac{s}{12})^a \times (\frac{W}{3})^b$	AP-42 Section 13.2.2. Unpaved Roads.			4.9	0.7	0.45			77	4.8		20	PM		6.05894	4.78076	
					1.5	0.9	0.45			77	4.8		20	PM_{10}		1.54420	1.21844	
					0.15	0.9	0.45			77	4.8		20	$PM_{2.5}$		0.15442	0.12184	
Wind erosion from aggregate and sand storage piles [Uncontrolled] [5, 6]	$E = 1.7 \left(\frac{s}{1.5}\right)\left(\frac{365 - P}{235}\right)\left(\frac{f}{15}\right)\left(\frac{k}{24}\right)$	Control of Open Fugitive Dust Sources, EPA-450/3-88-008, September 1988, Page 4-17.			1				17.6	77	4.8			PM				0.32594
					0.5				17.6	77	4.8			PM_{10}				0.16297
					0.15				17.6	77	4.8			$PM_{2.5}$				0.04889

References:
[1] Unobstructed wind speed AERMET met data.
[2] Pasco Tri-Cities Airport precipitation data, 1991-2020, obtained from the National Climatic Data Center.
[3] AP-42, Table 13.2.2-1, sand and gravel processing
[4] AP-42, Table 13.2.1-3, Concrete Batching
[5] Particle size multiplier (k) for wind erosion from aggregate and sand storage piles are assumed using engineering judgements.
[6] The (k/24) factor has been added to the original equation for the conversion of TSP lb/day/acre into $PM/PM_{10}/PM_{2.5}$ lb/hour/acre.

	Source Description	Maximum Capacity	Units	Criteria Pollutants			Trace Metals									
				PM	PM_{10}	$PM_{2.5}$	Arsenic	Beryllium	Cadmium	Total Chromium	Lead	Manganese	Nickel	Total Phosphorus	Selenium	Total HAPs
Uncontrolled Emissions Calculations	Aggregate delivery to ground storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		95,484 tons/yr	(tons/total duration)	0.04	0.02	0.00										
	Sand delivery to ground storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		73,602 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Aggregate transfer to conveyor	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		95,484 tons/yr	(tons/total duration)	0.04	0.02	0.00										
	Sand transfer to conveyor	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		73,602 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Aggregate transfer to elevated storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		95,484 tons/yr	(tons/total duration)	0.04	0.02	0.00										
	Sand transfer to elevated storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		73,602 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Cement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	3.30E-02	1.65E-02	2.48E-03	5.54E-04	5.91E-06	7.72E-05	8.32E-05	2.43E-04	6.67E-02	5.81E-03	3.89E-03	0.00E+00	7.73E-02
		1,423 tons/day	(avg lb/hr) - Max Day	5.93E-03	2.96E-03	4.45E-04	2.39E-03	2.55E-05	3.33E-04	3.58E-04	1.05E-03	2.87E-01	2.50E-02	1.68E-02	0.00.E+00	3.33E-01
		198,925 tons/yr	(tons/total duration)	9.95E-03	4.97E-03	7.46E-04	1.67E-04	1.78E-06	2.33E-05	2.51E-05	7.32E-05	2.01E-02	1.75E-03	1.17E-03	0.00.E+00	2.33E-02
	Cement supplement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	4.95E-02	3.30E-02	4.95E-03	1.65E-02	1.49E-03	3.27E-06	2.01E-02	8.58E-03	4.22E-03	3.76E-02	5.84E-02	1.19E-03	1.48E-01
		1,423 tons/day	(avg lb/hr) - Max Day	8.89E-03	5.93E-03	8.89E-04	7.11E-02	6.43E-03	1.41E-05	8.68E-02	3.70E-02	1.82E-02	1.62E-01	2.52E-01	5.15E-03	6.39E-01
		198,925 tons/yr	(tons/total duration)	1.49E-02	9.95E-03	1.49E-03	4.97E-03	4.50E-04	9.85E-07	6.07E-03	2.59E-03	1.27E-03	1.13E-02	1.76E-02	3.60E-04	4.47E-02
	Weigh hopper loading	330 tons/hr	(lb/hr) - Max Hour	1.30	0.63	0.09										
		1,423 tons/day	(avg lb/hr) - Max Day	0.23	0.11	0.02										
		198,925 tons/yr	(tons/total duration)	0.39	0.19	0.03										
	Truck mix loading	330 tons/hr	(lb/hr) - Max Hour	52.02	14.42	2.33	4.03E-03	8.05E-05	1.13E-05	3.76E-03	1.19E-03	2.02E-02	3.93E-03	1.27E-02	8.65E-04	4.67E-02
		1,423 tons/day	(avg lb/hr) - Max Day	9.34	2.59	0.42	1.74E-02	3.47E-04	4.86E-05	1.62E-02	5.15E-03	8.71E-02	1.69E-02	5.46E-02	3.73E-03	2.01.E-01
		198,925 tons/yr	(tons/total duration)	15.68	4.35	0.70	1.21E-03	2.43E-05	3.40E-06	1.13E-03	3.60E-04	6.09E-03	1.18E-03	3.82E-03	2.61E-04	1.41.E-02
	Vehicle Traffic (paved roads)	5 mi/hr	(lb/hr) - Max Hour	101.10	2.02	0.50										
		19 mi/day	(avg lb/hr) - Max Day	18.16	0.36	0.09										
		2,719 mi/yr	(tons/total duration)	28.87	0.58	0.14										
	Vehicle Traffic (unpaved roads)	4.39 mi/hr	(lb/hr) - Max Hour	26.59	6.78	0.68										
		18.92 mi/hr	(avg lb/hr) - Max Day	4.78	1.22	0.12										
		2,645 mi/yr	(tons/total duration)	6.32	1.61	0.16										
	Wind erosion from aggregate and sand storage piles	0.24 total acres	(lb/hr) - Max Hour	0.078	0.039	0.012										
			(avg lb/hr) - Max Day	3.25E-03	1.62E-03	4.87E-04										
			(tons/total duration)	1.14E-01	5.69E-02	1.71E-02										
		Totals Emissions:	**(lb/hr) - Max Hour**	**181.87**	**24.27**	**3.66**	**2.11E-02**	**1.58E-03**	**9.18E-05**	**2.40E-02**	**1.00E-02**	**9.11E-02**	**4.74E-02**	**7.50E-02**	**2.06E-03**	**2.72E-01**
			(avg lb/hr) - Max Day	**32.66**	**4.35**	**0.66**	**9.09E-02**	**6.80E-03**	**3.96E-04**	**1.03E-01**	**4.32E-02**	**3.93E-01**	**2.04E-01**	**3.23E-01**	**8.88E-03**	**1.17E+00**
			(tons/total duration)	**51.61**	**6.90**	**1.07**	**6.35E-03**	**4.76E-04**	**2.77E-05**	**7.23E-03**	**3.02E-03**	**2.75E-02**	**1.43E-02**	**2.26E-02**	**6.21E-04**	**8.20E-02**
Controlled Emissions Calculations	Aggregate delivery to ground storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		95,484 tons/yr	(tons/total duration)	0.04	0.02	0.00										
	Sand delivery to ground storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		73,602 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Aggregate transfer to conveyor	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		95,484 tons/yr	(tons/total duration)	0.04	0.02	0.00										
	Sand transfer to conveyor	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		73,602 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Aggregate transfer to elevated storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		95,484 tons/yr	(tons/total duration)	0.04	0.02	0.00										
	Sand transfer to elevated storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		73,602 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Cement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	6.60E-04	3.30E-04	4.95E-05	1.40E-06	1.60E-07	1.54E-06	9.57E-06	3.60E-06	3.86E-05	1.38E-05	7.79E-06	0.00E+00	7.65E-05
		1,423 tons/day	(avg lb/hr) - Max Day	1.19E-04	5.93E-05	8.89E-06	2.51E-07	2.88E-08	6.66E-06	4.13E-05	1.55E-05	1.66E-04	5.95E-05	3.36E-05	0.00.E+00	3.23E-04
		198,925 tons/yr	(tons/total duration)	1.99E-04	9.95E-05	1.49E-05	4.22E-07	4.83E-08	4.65E-07	2.88E-06	1.08E-06	1.16E-05	4.16E-06	2.35E-06	0.00.E+00	2.30E-05
	Cement supplement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	9.90E-04	6.60E-04	9.90E-05	3.30E-04	2.98E-05	6.53E-08	4.03E-04	1.72E-04	8.45E-05	7.52E-04	1.17E-03	2.39E-05	2.96E-03
		1,423 tons/day	(avg lb/hr) - Max Day	1.78E-04	1.19E-04	1.78E-05	1.42E-03	1.29E-04	2.82E-07	1.74E-03	7.40E-04	3.64E-04	3.24E-03	5.04E-03	1.03E-04	1.28E-02
		198,925 tons/yr	(tons/total duration)	2.98E-04	1.99E-04	2.98E-05	9.95E-05	8.99E-06	1.97E-08	1.21E-04	5.17E-05	2.55E-05	2.27E-04	3.52E-04	7.20E-06	8.93E-04
	Weigh hopper loading	330 tons/hr	(lb/hr) - Max Hour	1.30	0.63	0.09										
		1,423 tons/day	(avg lb/hr) - Max Day	0.23	0.11	0.02										
		198,925 tons/yr	(tons/total duration)	0.39	0.19	0.03										
	Truck mix loading	330 tons/hr	(lb/hr) - Max Hour	2.30	0.92	0.14	1.99E-04	3.43E-05	2.99E-06	1.35E-03	5.05E-04	6.86E-03	1.58E-02	4.06E-03	3.73E-05	2.88E-02
		1,423 tons/day	(avg lb/hr) - Max Day	0.41	0.16	0.02	8.56E-04	1.48E-04	1.29E-05	5.83E-03	2.18E-03	2.96E-02	6.80E-02	1.75E-02	1.61E-04	1.24E-01
		198,925 tons/yr	(tons/total duration)	0.69	0.28	0.04	5.99E-05	1.03E-05	9.01E-07	4.08E-04	1.52E-04	2.07E-03	4.75E-03	1.22E-03	1.12E-05	8.69.E-03
	Vehicle Traffic (paved roads)	5 mi/hr	(lb/hr) - Max Hour	20.22	2.02	0.50										
		19 mi/day	(avg lb/hr) - Max Day	3.63	0.07	0.018										
		2,719 mi/yr	(tons/total duration)	5.77	0.58	0.14										
	Vehicle Traffic (unpaved roads)	4.39 mi/hr	(lb/hr) - Max Hour	5.32	1.36	0.14										
		18.92 mi/hr	(avg lb/hr) - Max Day	0.96	0.24	0.02										
		2,645 mi/yr	(tons/total duration)	1.26	0.32	0.03										
	Wind erosion from aggregate and sand storage piles	0.24 total acres	(lb/hr) - Max Hour	0.023	0.012	0.004										
			(avg lb/hr) - Max Day	9.74E-04	4.87E-04	1.46E-04										
			(tons/total duration)	3.41E-02	1.71E-02	5.12E-03										
		Totals Emissions:	**(lb/hr) - Max Hour**	**29.86**	**5.27**	**0.92**	**5.30E-04**	**6.43E-05**	**4.60E-06**	**1.77E-03**	**6.80E-04**	**6.99E-03**	**1.65E-02**	**5.23E-03**	**6.12E-05**	**3.19E-02**
			(avg lb/hr) - Max Day	**5.36**	**0.65**	**0.09**	**2.28E-03**	**2.77E-04**	**1.98E-05**	**7.61E-03**	**2.93E-03**	**3.01E-02**	**7.13E-02**	**2.26E-02**	**2.64E-04**	**1.37E-01**
			(tons/total duration)	**8.37**	**1.48**	**0.26**	**1.60E-04**	**1.94E-05**	**1.39E-06**	**5.32E-04**	**2.05E-04**	**2.11E-03**	**4.99E-03**	**1.58E-03**	**1.84E-05**	**9.60E-03**

Emission Factors

Emission Factor Source Description	Emission Control Efficiency	Units	PM	PM_{10}	$PM_{2.5}$	Arsenic	Beryllium	Cadmium	Total Chromium	Lead	Manganese	Nickel	Total Phosphorus	Selenium	Total HAPs
Aggregate delivery to ground storage[1]	0%	(lb/ton aggregate)	0.00083	0.00039	0.00006										
Sand delivery to ground storage[1]	0%	(lb/ton sand)	0.00083	0.00039	0.00006										
Aggregate transfer to conveyor[1]	0%	(lb/ton aggregate)	0.00083	0.00039	0.00006										
Sand transfer to conveyor[1]	0%	(lb/ton sand)	0.00083	0.00039	0.00006										
Aggregate transfer to elevated storage[1]	0%	(lb/ton aggregate)	0.00083	0.00039	0.00006										
Sand transfer to elevated storage[1]	0%	(lb/ton sand)	0.00083	0.00039	0.00006										
Cement delivery to silo[2, 4, 5, 6]	0%	(lb/ton concrete)	1.00E-04	5.00E-05	7.50E-06	1.68E-06	1.79E-08	2.34E-07	2.52E-07	7.36E-07	2.02E-04	1.76E-05	1.18E-05	ND	
	98%	(lb/ton concrete)	2.00E-06	1.00E-06	1.50E-07	4.24E-09	4.86E-10	4.68E-09	2.90E-08	1.09E-08	1.17E-07	4.18E-08	2.36E-08	ND	
Cement supplement delivery to silo[2, 4, 5, 6]	0%	(lb/ton concrete)	1.50E-04	1.00E-04	1.50E-05	5.00E-05	4.52E-06	9.90E-09	6.10E-05	2.60E-05	1.28E-05	1.14E-04	1.77E-04	3.62E-06	
	98%	(lb/ton concrete)	3.00E-06	2.00E-06	3.00E-07	1.00E-06	9.04E-08	1.98E-10	1.22E-06	5.20E-07	2.56E-07	2.28E-06	3.54E-06	7.24E-08	
Weigh hopper loading[2, 4, 5]	0%	(lb/ton concrete)	0.00395	0.00190	0.00029										
Truck mix loading[3, 6, 7]	0%	(lb/ton concrete)	0.15764	0.04371	0.00705	1.22E-05	2.44E-07	3.42E-08	1.14E-05	3.62E-06	6.12E-05	1.19E-05	3.84E-05	2.62E-06	
	94%	(lb/ton concrete)	0.00696	0.00278	0.00042	6.02E-07	1.04E-07	9.06E-09	4.10E-06	1.53E-06	2.08E-05	4.78E-05	1.23E-05	1.13E-07	
Vehicle traffic (paved roads)[8, 9, 10]	0%	(lb/VMT)	22.413	0.448	0.110										
[Short-Term Emission Factor]	80%	(lb/VMT)	4.483	0.090	0.022										
Vehicle traffic (paved roads)[8, 9, 10]	0%	(lb/VMT)	21.231	0.425	0.104										
[Annual Emission Factor]	80%	(lb/VMT)	4.246	0.085	0.021										
Vehicle traffic (unpaved roads)[8, 9, 10]	0%	(lb/VMT)	6.059	1.544	0.154										
[Short-Term Emission Factor]	80%	(lb/VMT)	1.212	0.309	0.031										
Vehicle traffic (unpaved roads)[8, 9, 10]	0%	(lb/VMT)	4.781	1.218	0.122										
[Annual Emission Factor]	80%	(lb/VMT)	0.956	0.244	0.024										
Wind erosion from aggregate and sand	0%	(lb/hr-acre)	0.326	0.163	0.049										
storage piles[8, 10]	70%	(lb/hr-acre)	0.098	0.049	0.015										

References:

[1] Uncontrolled emission factors for PM, PM_{10}, and $PM_{2.5}$ are based on the Predictive Emission Factor Equation in Section 13.2.4.3, AP-42 Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources.
[2] Uncontrolled emission factors for PM and PM_{10} are from Table 11.12-5. Controlled emissions are based on the indicated control efficiency.
[3] For truck mix loading, the emissions of PM, PM_{10}, and $PM_{2.5}$ are calculated by multiplying the emission factor calculated using Equation 11.12-2 by a factor of 0.282 to convert from emissions per ton of cement and cement supplement to emissions per yard of concrete.
[4] Assuming 2 tons of concrete is approximately equivalent to 1 CY for conversion.
[5] Uncontrolled emission factors for $PM_{2.5}$ are assumed to be 16% of the PM_{10} emission factor, based on the ratio of uncontrolled $PM_{2.5}$ to PM_{10} presented in Table 11.12-3. Controlled emissions are based on the indicated control efficiency.
[6] Emission factors for trace metals are from Table 11.12-8. In cases where "ND" was reported for either the controlled or the uncontrolled value, the corresponding missing value was calculated using the unit's control device efficiency.
[7] Uncontrolled and controlled emission factors for PM, PM_{10}, and $PM_{2.5}$ are computed from Table 11.12-3. Control efficiency calculated by taking the worst case scenario when dividing the calculated controlled emissions by the uncontrolled emission factors in Table 11.12-3.
[8] Emission factors derived from equations in tab "PM Emission Factors" for certain operating scenarios with varying conditions.
[9] Short term PM emission factors are used to calculate hourly and daily emissions while annual emission factors are used to calculate yearly emissions.
[10] WRAP Fugitive Dust Handbook

	Source Description	Maximum Capacity	Units	Criteria Pollutants			Trace Metals									
				PM	PM_{10}	$PM_{2.5}$	Arsenic	Beryllium	Cadmium	Total Chromium	Lead	Manganese	Nickel	Total Phosphorus	Selenium	Total HAPs
Uncontrolled Emissions Calculations	Aggregate delivery to ground storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		67,972 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Sand delivery to ground storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		52,395 tons/yr	(tons/total duration)	0.02	0.01	0.00										
	Aggregate transfer to conveyor	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		67,972 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Sand transfer to conveyor	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		52,395 tons/yr	(tons/total duration)	0.02	0.01	0.00										
	Aggregate transfer to elevated storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		67,972 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Sand transfer to elevated storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		52,395 tons/yr	(tons/total duration)	0.02	0.01	0.00										
	Cement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	3.30E-02	1.65E-02	2.48E-03	5.54E-04	5.91E-06	7.72E-05	8.32E-05	2.43E-04	6.67E-02	5.81E-03	3.89E-03	0.00E+00	7.73E-02
		1,423 tons/day	(avg lb/hr) - Max Day	5.93E-03	2.96E-03	4.45E-04	2.39E-03	2.55E-05	3.33E-04	3.58E-04	1.05E-03	2.87E-01	2.50E-02	1.68E-02	0.00.E+00	3.33.E-01
		141,608 tons/yr	(tons/total duration)	7.08E-03	3.54E-03	5.31E-04	1.19E-04	1.27E-06	1.66E-05	1.78E-05	5.21E-05	1.43E-02	1.25E-03	8.35E-04	0.00.E+00	1.66.E-02
	Cement supplement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	4.95E-02	3.30E-02	4.95E-03	1.65E-02	1.49E-03	3.27E-06	2.01E-02	8.58E-03	4.22E-03	3.76E-02	5.84E-02	1.19E-03	1.48E-01
		1,423 tons/day	(avg lb/hr) - Max Day	8.89E-03	5.93E-03	8.89E-04	7.11E-02	6.43E-03	1.41E-05	8.68E-02	3.70E-02	1.82E-02	1.62E-01	2.52E-01	5.15E-03	6.39E-01
		141,608 tons/yr	(tons/total duration)	1.06E-02	7.08E-03	1.06E-03	3.54E-03	3.20E-04	7.01E-07	4.32E-03	1.84E-03	9.06E-04	8.07E-03	1.25E-02	2.56E-04	3.18E-02
	Weigh hopper loading	330 tons/hr	(lb/hr) - Max Hour	1.30	0.63	0.09										
		1,423 tons/day	(avg lb/hr) - Max Day	0.23	0.11	0.02										
		141,608 tons/yr	(tons/total duration)	0.28	0.13	0.02										
	Truck mix loading	330 tons/hr	(lb/hr) - Max Hour	52.02	14.42	2.33	4.03E-03	8.05E-05	1.13E-05	3.76E-03	1.19E-03	2.02E-02	3.93E-03	1.27E-02	8.65E-04	4.67E-02
		1,423 tons/day	(avg lb/hr) - Max Day	9.34	2.59	0.42	1.74E-02	3.47E-04	4.86E-05	1.62E-02	5.15E-03	8.71E-02	1.69E-02	5.46E-02	3.73E-03	2.01.E-01
		141,608 tons/yr	(tons/total duration)	11.16	3.09	0.50	8.64E-04	1.73E-05	2.42E-06	8.07E-04	2.56E-04	4.33E-03	8.43E-04	2.72E-03	1.86E-04	1.00.E-02
	Vehicle Traffic (paved roads)	5 mi/hr	(lb/hr) - Max Hour	101.10	2.02	0.50										
		19 mi/day	(avg lb/hr) - Max Day	18.16	0.36	0.09										
		1,936 mi/yr	(tons/total duration)	20.55	0.41	0.10										
	Vehicle Traffic (unpaved roads)	4.39 mi/hr	(lb/hr) - Max Hour	26.59	6.78	0.68										
		18.92 mi/hr	(avg lb/hr) - Max Day	4.78	1.22	0.12										
		2,645 mi/yr	(tons/total duration)	6.32	1.61	0.16										
	Wind erosion from aggregate and sand storage piles	0.24 total acres	(lb/hr) - Max Hour	0.078	0.039	0.012										
			(avg lb/hr) - Max Day	3.25E-03	1.62E-03	4.87E-04										
			(tons/total duration)	1.14E-01	5.69E-02	1.71E-02										
		Totals Emissions:	**(lb/hr) - Max Hour**	**181.87**	**24.27**	**3.66**	**2.11E-02**	**1.58E-03**	**9.18E-05**	**2.40E-02**	**1.00E-02**	**9.11E-02**	**4.74E-02**	**7.50E-02**	**2.06E-03**	**2.72E-01**
			(avg lb/hr) - Max Day	**32.66**	**4.35**	**0.66**	**9.09E-02**	**6.80E-03**	**3.96E-04**	**1.03E-01**	**4.32E-02**	**3.93E-01**	**2.04E-01**	**3.23E-01**	**8.88E-03**	**1.17E+00**
			(tons/total duration)	**38.59**	**5.39**	**0.81**	**4.52E-03**	**3.39E-04**	**1.97E-05**	**5.14E-03**	**2.15E-03**	**1.95E-02**	**1.02E-02**	**1.61E-02**	**4.42E-04**	**5.84E-02**
Controlled Emissions Calculations	Aggregate delivery to ground storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		67,972 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Sand delivery to ground storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		52,395 tons/yr	(tons/total duration)	0.02	0.01	0.00										
	Aggregate transfer to conveyor	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		67,972 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Sand transfer to conveyor	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		52,395 tons/yr	(tons/total duration)	0.02	0.01	0.00										
	Aggregate transfer to elevated storage	158 tons/hr	(lb/hr) - Max Hour	0.13	0.06	0.01										
		683 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		67,972 tons/yr	(tons/total duration)	0.03	0.01	0.00										
	Sand transfer to elevated storage	122 tons/hr	(lb/hr) - Max Hour	0.10	0.05	0.01										
		526 tons/day	(avg lb/hr) - Max Day	0.02	0.01	0.00										
		52,395 tons/yr	(tons/total duration)	0.02	0.01	0.00										
	Cement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	6.60E-04	3.30E-04	4.95E-05	1.40E-06	1.60E-07	1.54E-06	9.57E-06	3.60E-06	3.86E-05	1.38E-05	7.79E-06	0.00E+00	7.65E-05
		1,423 tons/day	(avg lb/hr) - Max Day	1.19E-04	5.93E-05	8.89E-06	2.51E-07	2.88E-08	6.66E-06	4.13E-05	1.55E-05	1.66E-04	5.95E-05	3.36E-05	0.00.E+00	3.23.E-04
		141,608 tons/yr	(tons/total duration)	1.42E-04	7.08E-05	1.06E-05	3.00E-07	3.44E-08	3.31E-07	2.05E-06	7.72E-07	8.28E-06	2.96E-06	1.67E-06	0.00.E+00	1.64.E-05
	Cement supplement delivery to silo	330 tons/hr	(lb/hr) - Max Hour	9.90E-04	6.60E-04	9.90E-05	3.30E-04	2.98E-05	6.53E-08	4.03E-04	1.72E-04	8.45E-05	7.52E-04	1.17E-03	2.39E-05	2.96E-03
		1,423 tons/day	(avg lb/hr) - Max Day	1.78E-04	1.19E-04	1.78E-05	1.42E-03	1.29E-04	2.82E-07	1.74E-03	7.40E-04	3.64E-04	3.24E-03	5.04E-03	1.03E-04	1.28E-02
		141,608 tons/yr	(tons/total duration)	2.12E-04	1.42E-04	2.12E-05	7.08E-05	6.40E-06	1.40E-08	8.64E-05	3.68E-05	1.81E-05	1.61E-04	2.51E-04	5.13E-06	6.36E-04
	Weigh hopper loading	330 tons/hr	(lb/hr) - Max Hour	1.30	0.63	0.09										
		1,423 tons/day	(avg lb/hr) - Max Day	0.234	0.113	0.017										
		141,608 tons/yr	(tons/total duration)	0.280	0.135	0.020										
	Truck mix loading	330 tons/hr	(lb/hr) - Max Hour	2.30	0.92	0.14	1.99E-04	3.43E-05	2.99E-06	1.35E-03	5.05E-04	6.86E-03	1.58E-02	4.06E-03	3.73E-05	2.88E-02
		1,423 tons/day	(avg lb/hr) - Max Day	0.41	0.16	0.02	8.56E-04	1.48E-04	1.29E-05	5.83E-03	2.18E-03	2.96E-02	6.80E-02	1.75E-02	1.61E-04	1.24.E-01
		141,608 tons/yr	(tons/total duration)	0.49	0.20	0.03	4.26E-05	7.36E-06	6.41E-07	2.90E-04	1.08E-04	1.47E-03	3.38E-03	8.71E-04	8.00E-06	6.19.E-03
	Vehicle Traffic (paved roads)	5 mi/hr	(lb/hr) - Max Hour	20.22	2.02	0.50										
		19 mi/day	(avg lb/hr) - Max Day	3.63	0.07	0.018										
		1,936 mi/yr	(tons/total duration)	4.11	0.41	0.10										
	Vehicle Traffic (unpaved roads)	4.39 mi/hr	(lb/hr) - Max Hour	5.32	1.36	0.14										
		18.92 mi/hr	(avg lb/hr) - Max Day	0.96	0.24	0.02										
		2,645 mi/yr	(tons/total duration)	1.26	0.32	0.03										
	Wind erosion from aggregate and sand storage piles	0.24 total acres	(lb/hr) - Max Hour	0.023	0.012	0.004										
			(avg lb/hr) - Max Day	9.74E-04	4.87E-04	1.46E-04										
			(tons/total duration)	3.41E-02	1.71E-02	5.12E-03										
		Totals Emissions:	**(lb/hr) - Max Hour**	**29.86**	**5.27**	**0.92**	**5.30E-04**	**6.43E-05**	**4.60E-06**	**1.77E-03**	**6.80E-04**	**6.99E-03**	**1.65E-02**	**5.23E-03**	**6.12E-05**	**3.19E-02**
			(avg lb/hr) - Max Day	**5.36**	**0.65**	**0.09**	**2.28E-03**	**2.77E-04**	**1.98E-05**	**7.61E-03**	**2.93E-03**	**3.01E-02**	**7.13E-02**	**2.26E-02**	**2.64E-04**	**1.37E-01**
			(tons/total duration)	**6.33**	**1.15**	**0.20**	**1.14E-04**	**1.38E-05**	**9.87E-07**	**3.79E-04**	**1.46E-04**	**1.50E-03**	**3.55E-03**	**1.12E-03**	**1.31E-05**	**6.84E-03**

Emission Factors

Emission Factor Source Description	Emission Control Efficiency	Units	PM	PM_{10}	$PM_{2.5}$	Arsenic	Beryllium	Cadmium	Total Chromium	Lead	Manganese	Nickel	Total Phosphorus	Selenium	Total HAPs
Aggregate delivery to ground storage[1]	0%	(lb/ton aggregate)	0.00083	0.00039	0.00006										
Sand delivery to ground storage[1]	0%	(lb/ton sand)	0.00083	0.00039	0.00006										
Aggregate transfer to conveyor[1]	0%	(lb/ton aggregate)	0.00083	0.00039	0.00006										
Sand transfer to conveyor[1]	0%	(lb/ton sand)	0.00083	0.00039	0.00006										
Aggregate transfer to elevated storage[1]	0%	(lb/ton aggregate)	0.00083	0.00039	0.00006										
Sand transfer to elevated storage[1]	0%	(lb/ton sand)	0.00083	0.00039	0.00006										
Cement delivery to silo[2, 4, 5, 6]	0%	(lb/ton concrete)	1.00E-04	5.00E-05	7.50E-06	1.68E-06	1.79E-08	2.34E-07	2.52E-07	7.36E-07	2.02E-04	1.76E-05	1.18E-05	ND	
	98%	(lb/ton concrete)	2.00E-06	1.00E-06	1.50E-07	4.24E-09	4.86E-10	4.68E-09	2.90E-08	1.09E-08	1.17E-07	4.18E-08	2.36E-08	ND	
Cement supplement delivery to silo[2, 4, 5, 6]	0%	(lb/ton concrete)	1.50E-04	1.00E-04	1.50E-05	5.00E-05	4.52E-06	9.90E-09	6.10E-05	2.60E-05	1.28E-05	1.14E-04	1.77E-04	3.62E-06	
	98%	(lb/ton concrete)	3.00E-06	2.00E-06	3.00E-07	1.00E-06	9.04E-08	1.98E-10	1.22E-06	5.20E-07	2.56E-07	2.28E-06	3.54E-06	7.24E-08	
Weigh hopper loading[2, 4, 5]	0%	(lb/ton concrete)	0.00395	0.00190	0.00029										
Truck mix loading[3, 6, 7]	0%	(lb/ton concrete)	0.15764	0.04371	0.00705	1.22E-05	2.44E-07	3.42E-08	1.14E-05	3.62E-06	6.12E-05	1.19E-05	3.84E-05	2.62E-06	
	94%	(lb/ton concrete)	0.00696	0.00278	0.00042	6.02E-07	1.04E-07	9.06E-09	4.10E-06	1.53E-06	2.08E-05	4.78E-05	1.23E-05	1.13E-07	
Vehicle traffic (paved roads)[8, 9, 10]	0%	(lb/VMT)	22.413	0.448	0.110										
[Short-Term Emission Factor]	80%	(lb/VMT)	4.483	0.090	0.022										
Vehicle traffic (paved roads)[8, 9, 10]	0%	(lb/VMT)	21.231	0.425	0.104										
[Annual Emission Factor]	80%	(lb/VMT)	4.246	0.085	0.021										
Vehicle traffic (unpaved roads)[8, 9, 10]	0%	(lb/VMT)	6.059	1.544	0.154										
[Short-Term Emission Factor]	80%	(lb/VMT)	1.212	0.309	0.031										
Vehicle traffic (unpaved roads)[8, 9, 10]	0%	(lb/VMT)	4.781	1.218	0.122										
[Annual Emission Factor]	80%	(lb/VMT)	0.956	0.244	0.024										
Wind erosion from aggregate and sand	0%	(lb/hr-acre)	0.326	0.163	0.049										
storage piles[8, 10]	70%	(lb/hr-acre)	0.098	0.049	0.015										

References:

[1] Uncontrolled emission factors for PM, PM_{10}, and $PM_{2.5}$ are based on the Predictive Emission Factor Equation in Section 13.2.4.3, AP-42 Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources.
[2] Uncontrolled emission factors for PM and PM_{10} are from Table 11.12-5. Controlled emissions are based on the indicated control efficiency.
[3] For truck mix loading, the emissions of PM, PM_{10}, and $PM_{2.5}$ are calculated by multiplying the emission factor calculated using Equation 11.12-2 by a factor of 0.282 to convert from emissions per ton of cement and cement supplement to emissions per yard of concrete.
[4] Assuming 2 tons of concrete is approximately equivalent to 1 CY for conversion.
[5] Uncontrolled emission factors for $PM_{2.5}$ are assumed to be 16% of the PM_{10} emission factor, based on the ratio of uncontrolled $PM_{2.5}$ to PM_{10} presented in Table 11.12-3. Controlled emissions are based on the indicated control efficiency.
[6] Emission factors for trace metals are from Table 11.12-8. In cases where "ND" was reported for either the controlled or the uncontrolled value, the corresponding missing value was calculated using the unit's control device efficiency.
[7] Uncontrolled and controlled emission factors for PM, PM_{10}, and $PM_{2.5}$ are computed from Table 11.12-3. Control efficiency calculated by taking the worst case scenario when dividing the calculated controlled emissions by the uncontrolled emission factors in Table 11.12-3.
[8] Emission factors derived from equations in tab "PM Emission Factors" for certain operating scenarios with varying conditions.
[9] Short term PM emission factors are used to calculate hourly and daily emissions while annual emission factors are used to calculate yearly emissions.
[10] WRAP Fugitive Dust Handbook

Parameters	Units	CBP Engines	Load Bank Engines
Total Quantity	(qty)	2	6
Quantity Located at HHW	(qty)	1	3
Quantity Located at HHE	(qty)	1	3
Engine Fuel Type		Diesel	Diesel
Engine Make		TBD	TBD
Engine Model		TBD	TBD
Rated Power	(kW)	500	2,000
Rated Output	(hp)	670	2680
Diesel Heat Content	(Btu/gal)	138,000	138,000
Engine Heat Input	(MMBtu/hr)	4.69	18.76
Max. Fuel Consumption	(gal/hr)	34.0	135.9
Operating Hours Each	(hrs)	500	500

Note:
Hourly fuel consumption is based on default brake-specific fuel consumption of 7,000 Btu/hp-hr, from AP-42 Table 3.4-1.

		EF	CBP Engines Emissions				Load Bank Engines Emissions			
			Single		Combined (1)		Single		Combined (3)	
		(lb/hp-hr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Criteria Pollutants [1, 5]	CO	5.50E-03	3.69	0.92	3.69	0.92	14.74	3.69	44.22	11.06
	NOx	2.40E-02	16.08	4.02	16.08	4.02	64.32	16.08	192.96	48.24
	PM	7.00E-04	0.47	0.12	0.47	0.12	1.88	0.47	5.63	1.41
	PM_{10}	7.00E-04	0.47	0.12	0.47	0.12	1.88	0.47	5.63	1.41
	$PM_{2.5}$	7.00E-04	0.47	0.12	0.47	0.12	1.88	0.47	5.63	1.41
	SO_2	1.21E-05	0.01	0.00	0.01	0.00	0.03	0.01	0.10	0.02
	VOC	7.05E-04	0.47	0.12	0.47	0.12	1.89	0.47	5.67	1.42
	Lead	0.00E+00	-	-	-	-	-	-	-	-
		(lb/MMBtu)	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
HAPs [3]	Acetaldehyde	2.52E-05	1.18E-04	5.18E-04	1.18E-04	5.18E-04	4.73E-04	2.07E-03	1.42E-03	6.21E-03
	Acrolein	7.88E-06	3.70E-05	1.62E-04	3.70E-05	1.62E-04	1.48E-04	6.47E-04	4.43E-04	1.94E-03
	Benzene	7.76E-04	3.64E-03	1.59E-02	3.64E-03	1.59E-02	1.46E-02	6.38E-02	4.37E-02	1.91E-01
	Formaldehyde	7.89E-05	3.70E-04	1.62E-03	3.70E-04	1.62E-03	1.48E-03	6.48E-03	4.44E-03	1.94E-02
	Naphthalene	1.30E-04	6.10E-04	2.67E-03	6.10E-04	2.67E-03	2.44E-03	1.07E-02	7.32E-03	3.20E-02
	Toluene	2.81E-04	1.32E-03	5.77E-03	1.32E-03	5.77E-03	5.27E-03	2.31E-02	1.58E-02	6.93E-02
	Xylenes	1.93E-04	9.05E-04	3.96E-03	9.05E-04	3.96E-03	3.62E-03	1.59E-02	1.09E-02	4.76E-02
	Total HAPs		7.00E-03	3.06E-02	7.00E-03	3.06E-02	2.80E-02	1.23E-01	8.40E-02	3.68E-01
PAHs [4]	Acenaphthene	4.68E-06	2.19E-05	9.61E-05	2.19E-05	9.61E-05	8.78E-05	3.85E-04	2.63E-04	1.15E-03
	Acenaphthylene	9.23E-06	4.33E-05	1.90E-04	4.33E-05	1.90E-04	1.73E-04	7.58E-04	5.19E-04	2.28E-03
	Anthracene	1.23E-06	5.77E-06	2.53E-05	5.77E-06	2.53E-05	2.31E-05	1.01E-04	6.92E-05	3.03E-04
	Benz(a)anthracene	6.22E-07	2.92E-06	1.28E-05	2.92E-06	1.28E-05	1.17E-05	5.11E-05	3.50E-05	1.53E-04
	Benzo(a)pyrene	2.57E-07	1.21E-06	5.28E-06	1.21E-06	5.28E-06	4.82E-06	2.11E-05	1.45E-05	6.34E-05
	Benzo(b)fluoranthene	1.11E-06	5.21E-06	2.28E-05	5.21E-06	2.28E-05	2.08E-05	9.12E-05	6.25E-05	2.74E-04
	Benzo(g,h,l)perylene	5.56E-07	2.61E-06	1.14E-05	2.61E-06	1.14E-05	1.04E-05	4.57E-05	3.13E-05	1.37E-04
	Benzo(k)fluoranthene	2.18E-07	1.02E-06	4.48E-06	1.02E-06	4.48E-06	4.09E-06	1.79E-05	1.23E-05	5.37E-05
	Chrysene	1.53E-06	7.18E-06	3.14E-05	7.18E-06	3.14E-05	2.87E-05	1.26E-04	8.61E-05	3.77E-04
	Dibenz(a,h)anthracene	3.46E-07	1.62E-06	7.11E-06	1.62E-06	7.11E-06	6.49E-06	2.84E-05	1.95E-05	8.53E-05
	Fluoranthene	4.03E-06	1.89E-05	8.28E-05	1.89E-05	8.28E-05	7.56E-05	3.31E-04	2.27E-04	9.93E-04
	Fluorene	1.28E-05	6.00E-05	2.63E-04	6.00E-05	2.63E-04	2.40E-04	1.05E-03	7.20E-04	3.16E-03
	Indeno(1,2,3,-d)pyrene	4.14E-07	1.94E-06	8.50E-06	1.94E-06	8.50E-06	7.77E-06	3.40E-05	2.33E-05	1.02E-04
	Naphthalene	1.30E-04	6.10E-04	2.67E-03	6.10E-04	2.67E-03	2.44E-03	1.07E-02	7.32E-03	3.20E-02
	Phenanthrene	4.08E-05	1.91E-04	8.38E-04	1.91E-04	8.38E-04	7.65E-04	3.35E-03	2.30E-03	1.01E-02
	Pyrene	3.71E-06	1.74E-05	7.62E-05	1.74E-05	7.62E-05	6.96E-05	3.05E-04	2.09E-04	9.15E-04
	Total PAH	2.12E-04	9.94E-04	4.35E-03	9.94E-04	4.35E-03	3.98E-03	1.74E-02	1.19E-02	5.23E-02

References:

[1] Parameters copied from the "Engine Parameters" tab.

Parameters	Units	CBP	Load Bank
Rated Output	(hp)	670	2,680
Engine Heat Input	(MMBtu/hr)	4.69	18.76
Operating Hours Each	(hrs)	500	500

[2] AP 42 Section 3.4 Table 3.4-1 for criteria pollutants.
[3] AP 42 Section 3.4 Table 3.4-3 for hazardous air pollutants (HAP).
[4] AP 42 Section 3.4 Table 3.4-4 for polycyclic aromatic hydrocarbons (PAH)
[5] Assume the sulfur content is 0.15%.

		EF	CBP Engines Emissions				Load Bank Engines Emissions			
			Single		Combined (1)		Single		Combined (3)	
		(lb/hp-hr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Criteria Pollutants [1][5]	CO	5.50E-03	3.69	0.92	3.69	0.92	14.74	3.69	44.22	11.06
	NOx	2.40E-02	16.08	4.02	16.08	4.02	64.32	16.08	192.96	48.24
	PM	7.00E-04	0.47	0.12	0.47	0.12	1.88	0.47	5.63	1.41
	PM_{10}	7.00E-04	0.47	0.12	0.47	0.12	1.88	0.47	5.63	1.41
	$PM_{2.5}$	7.00E-04	0.47	0.12	0.47	0.12	1.88	0.47	5.63	1.41
	SO_2	1.21E-05	0.01	0.00	0.01	0.00	0.03	0.01	0.10	0.02
	VOC	7.05E-04	0.47	0.12	0.47	0.12	1.89	0.47	5.67	1.42
	Lead	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		(lb/MMBtu)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
HAPs [3]	Acetaldehyde	2.52E-05	1.18E-04	5.18E-04	1.18E-04	5.18E-04	4.73E-04	2.07E-03	1.42E-03	6.21E-03
	Acrolein	7.88E-06	3.70E-05	1.62E-04	3.70E-05	1.62E-04	1.48E-04	6.47E-04	4.43E-04	1.94E-03
	Benzene	7.76E-04	3.64E-03	1.59E-02	3.64E-03	1.59E-02	1.46E-02	6.38E-02	4.37E-02	1.91E-01
	Formaldehyde	7.89E-05	3.70E-04	1.62E-03	3.70E-04	1.62E-03	1.48E-03	6.48E-03	4.44E-03	1.94E-02
	Naphthalene	1.30E-04	6.10E-04	2.67E-03	6.10E-04	2.67E-03	2.44E-03	1.07E-02	7.32E-03	3.20E-02
	Toluene	2.81E-04	1.32E-03	5.77E-03	1.32E-03	5.77E-03	5.27E-03	2.31E-02	1.58E-02	6.93E-02
	Xylenes	1.93E-04	9.05E-04	3.96E-03	9.05E-04	3.96E-03	3.62E-03	1.59E-02	1.09E-02	4.76E-02
	Total HAPs		7.00E-03	3.06E-02	7.00E-03	3.06E-02	2.80E-02	1.23E-01	8.40E-02	3.68E-01
PAHs [4]	Acenaphthene	4.68E-06	2.19E-05	9.61E-05	2.19E-05	9.61E-05	8.78E-05	3.85E-04	2.63E-04	1.15E-03
	Acenaphthylene	9.23E-06	4.33E-05	1.90E-04	4.33E-05	1.90E-04	1.73E-04	7.58E-04	5.19E-04	2.28E-03
	Anthracene	1.23E-06	5.77E-06	2.53E-05	5.77E-06	2.53E-05	2.31E-05	1.01E-04	6.92E-05	3.03E-04
	Benz(a)anthracene	6.22E-07	2.92E-06	1.28E-05	2.92E-06	1.28E-05	1.17E-05	5.11E-05	3.50E-05	1.53E-04
	Benzo(a)pyrene	2.57E-07	1.21E-06	5.28E-06	1.21E-06	5.28E-06	4.82E-06	2.11E-05	1.45E-05	6.34E-05
	Benzo(b)fluoranthene	1.11E-06	5.21E-06	2.28E-05	5.21E-06	2.28E-05	2.08E-05	9.12E-05	6.25E-05	2.74E-04
	Benzo(g,h,l)perylene	5.56E-07	2.61E-06	1.14E-05	2.61E-06	1.14E-05	1.04E-05	4.57E-05	3.13E-05	1.37E-04
	Benzo(k)fluoranthene	2.18E-07	1.02E-06	4.48E-06	1.02E-06	4.48E-06	4.09E-06	1.79E-05	1.23E-05	5.37E-05
	Chrysene	1.53E-06	7.18E-06	3.14E-05	7.18E-06	3.14E-05	2.87E-05	1.26E-04	8.61E-05	3.77E-04
	Dibenz(a,h)anthracene	3.46E-07	1.62E-06	7.11E-06	1.62E-06	7.11E-06	6.49E-06	2.84E-05	1.95E-05	8.53E-05
	Fluoranthene	4.03E-06	1.89E-05	8.28E-05	1.89E-05	8.28E-05	7.56E-05	3.31E-04	2.27E-04	9.93E-04
	Fluorene	1.28E-05	6.00E-05	2.63E-04	6.00E-05	2.63E-04	2.40E-04	1.05E-03	7.20E-04	3.16E-03
	Indeno(1,2,3,-d)pyrene	4.14E-07	1.94E-06	8.50E-06	1.94E-06	8.50E-06	7.77E-06	3.40E-05	2.33E-05	1.02E-04
	Naphthalene	1.30E-04	6.10E-04	2.67E-03	6.10E-04	2.67E-03	2.44E-03	1.07E-02	7.32E-03	3.20E-02
	Phenanthrene	4.08E-05	1.91E-04	8.38E-04	1.91E-04	8.38E-04	7.65E-04	3.35E-03	2.30E-03	1.01E-02
	Pyrene	3.71E-06	1.74E-05	7.62E-05	1.74E-05	7.62E-05	6.96E-05	3.05E-04	2.09E-04	9.15E-04
	Total PAH	2.12E-04	9.94E-04	4.35E-03	9.94E-04	4.35E-03	3.98E-03	1.74E-02	1.19E-02	5.23E-02

References:

[1] Parameters copied from the "Engine Parameters" tab.

Parameters	Units	CBP	Load Bank
Rated Output	(hp)	670	2,680
Engine Heat Input	(MMBtu/hr)	4.69	18.76
Operating Hours Each	(hrs)	500	500

[2] AP 42 Section 3.4 Table 3.4-1 for criteria pollutants.
[3] AP 42 Section 3.4 Table 3.4-3 for hazardous air pollutants (HAP).
[4] AP 42 Section 3.4 Table 3.4-4 for polycyclic aromatic hydrocarbons (PAH)
[5] Assume the sulfur content is 0.15%.

APPENDIX B: MODEL INPUTS

AERMOD
POINT Sources

Source ID	X Coord.	Y Coord.	Base Elevation	Release Height	PM_{10} Emission Rate		$PM_{2.5}$ Emission Rate		CO Emission Rate		NO_x Emission Rate		SO_2 Emission Rate		Gas Exit Temperature	Gas Exit Velocity	Inside Diameter	Description
	(m)	(m)	(m)	(m)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(K)	(m/s)	(m)	
ESENG1	329247.37	5103134.23	440.69	5.85	1.88E+00	2.36E-01	1.88E+00	2.36E-01	1.47E+01	1.86E+00	6.43E+01	8.10E+00	3.25E-02	4.10E-03	600	50	0.393192	East Substation Loading Engine 1
ESENG2	329247.37	5103129.68	440.69	5.85	1.88E+00	2.36E-01	1.88E+00	2.36E-01	1.47E+01	1.86E+00	6.43E+01	8.10E+00	3.25E-02	4.10E-03	600	50	0.393192	East Substation Loading Engine 2
ESENG3	329247.37	5103124.92	440.69	5.85	1.88E+00	2.36E-01	1.88E+00	2.36E-01	1.47E+01	1.86E+00	6.43E+01	8.10E+00	3.25E-02	4.10E-03	600	50	0.393192	East Substation Loading Engine 3
ELCBENG	329469.69	5103182.16	440.69	3.9	4.69E-01	5.91E-02	4.69E-01	5.91E-02	3.69E+00	4.64E-01	1.61E+01	2.03E+00	8.13E-03	1.02E-03	600	50	0.19812	East Laydown CBP Engine 1
ECBBLDG	329458.3491	5103186.192	440.69	15.24	2.97E-01	3.75E-02	4.46E-02	5.62E-03							0	3.048	1.57	East Laydown CBP Exhaust from Main Building
ECBSILO1	329450.8552	5103182.517	440.69	18.29	9.88E-05	1.24E-05	1.48E-05	1.87E-06							0	3.048	1.22	East Laydown CBP Silo 1
ECBSILO2	329449.7765	5103187.046	440.69	18.29	9.88E-05	1.24E-05	1.48E-05	1.87E-06							0	3.048	1.22	East Laydown CBP Silo 2
ECBSILO3	329450.6461	5103191.662	440.69	18.29	9.88E-05	1.24E-05	1.48E-05	1.87E-06							0	3.048	1.22	East Laydown CBP Silo 3
WSENG1	303058.24	5118114.6	421.13	5.85	1.88E+00	2.36E-01	1.88E+00	2.36E-01	1.47E+01	1.86E+00	6.43E+01	8.10E+00	3.25E-02	4.10E-03	600	50	0.393192	West Substation Loading Engine 1
WSENG2	303058.24	5118110.18	421.13	5.85	1.88E+00	2.36E-01	1.88E+00	2.36E-01	1.47E+01	1.86E+00	6.43E+01	8.10E+00	3.25E-02	4.10E-03	600	50	0.393192	West Substation Loading Engine 2
WSENG3	303058.24	5118105.64	421.13	5.85	1.88E+00	2.36E-01	1.88E+00	2.36E-01	1.47E+01	1.86E+00	6.43E+01	8.10E+00	3.25E-02	4.10E-03	600	50	0.393192	West Substation Loading Engine 3
WLCBENG	317848.04	5109700.25	561.17	3.9	4.69E-01	5.91E-02	4.69E-01	5.91E-02	3.69E+00	4.64E-01	1.61E+01	2.03E+00	8.13E-03	1.02E-03	600	50	0.19812	West Laydown CBP Engine 1
WCBBLDG	317847.19	5109712.80	561.17	15.24	2.97E-01	3.75E-02	4.46E-02	5.62E-03							0	3.048	1.57	West Laydown CBP Exhaust from Main Building
WCBSILO1	317839.63	5109716.34	561.17	18.29	9.88E-05	1.24E-05	1.48E-05	1.87E-06							0	3.048	1.22	West Laydown CBP Silo 1
WCBSILO2	317838.63	5109711.80	561.17	18.29	9.88E-05	1.24E-05	1.48E-05	1.87E-06							0	3.048	1.22	West Laydown CBP Silo 2
WCBSILO3	317839.58	5109707.20	561.17	18.29	9.88E-05	1.24E-05	1.48E-05	1.87E-06							0	3.048	1.22	West Laydown CBP Silo 3

AERMOD
VOLUME Sources

Source ID	X Coord.	Y Coord.	Base Elevation	Release Height	PM_{10} Emission Rate		$PM_{2.5}$ Emission Rate		CO Emission Rate		NO_x Emission Rate	SO_2 Emission Rate	Side Length	Building Height	Initial Lateral Dimension	Initial Vertical Dimension	Description
	(m)	(m)	(m)	(m)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(lb/hr)	(m)	(m)	(m)	(m)	
ELCBHOP1	329502.68	5103181.89	440.69	3.05	6.61E-03	8.33E-04	1.00E-03	1.26E-04					4.11	6.10	0.96	2.84	East Laydown: CBP Loading to hopper 1
ELCBHOP2	329502.65	5103186.18	440.69	3.05	6.61E-03	8.33E-04	1.00E-03	1.26E-04					4.11	6.10	0.96	2.84	East Laydown: CBP Loading to hopper 2
ELCBHOP3	329502.61	5103190.16	440.69	3.05	6.61E-03	8.33E-04	1.00E-03	1.26E-04					4.11	6.10	0.96	2.84	East Laydown: CBP Loading to hopper 3
ELCBSP1	329451.47	5103139.67	440.69	1.52	3.97E-03	5.00E-04	6.01E-04	7.57E-05					0.91		0.21	0.71	East Laydown: Front-End Loader Drop to CBP storage pile 1
ELCBSP2	329496.26	5103139.85	440.69	1.52	3.97E-03	5.00E-04	6.01E-04	7.57E-05					0.91		0.21	0.71	East Laydown: Front-End Loader Drop to CBP storage pile 2
ELCBSP3	329534.98	5103140.22	440.69	1.52	3.97E-03	5.00E-04	6.01E-04	7.57E-05					0.91		0.21	0.71	East Laydown: Front-End Loader Drop to CBP storage pile 3
WLCBHOP1	317919.10	5109713.21	561.17	3.05	6.61E-03	8.33E-04	1.00E-03	1.26E-04					4.11	6.10	0.96	2.84	West Laydown: CBP Loading to hopper 1
WLCBHOP2	317919.11	5109709.10	561.17	3.05	6.61E-03	8.33E-04	1.00E-03	1.26E-04					4.11	6.10	0.96	2.84	West Laydown: CBP Loading to hopper 2
WLCBHOP3	317919.11	5109704.98	561.17	3.05	6.61E-03	8.33E-04	1.00E-03	1.26E-04					4.11	6.10	0.96	2.84	West Laydown: CBP Loading to hopper 3
WLCBSP1	317868.67	5109756.58	561.17	1.52	3.97E-03	5.00E-04	6.01E-04	7.57E-05					0.91		0.21	0.71	West Laydown: Front-End Loader Drop to CBP storage pile 1
WLCBSP2	317913.45	5109755.73	561.17	1.52	3.97E-03	5.00E-04	6.01E-04	7.57E-05					0.91		0.21	0.71	West Laydown: Front-End Loader Drop to CBP storage pile 2
WLCBSP3	317952.17	5109754.77	561.17	1.52	3.97E-03	5.00E-04	6.01E-04	7.57E-05					0.91		0.21	0.71	West Laydown: Front-End Loader Drop to CBP storage pile 3

AERMOD
AREA Sources

Source ID	AREA Source Type	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	PM_{10} Emission Rate (lb/hr)	$PM_{2.5}$ Emission Rate (lb/hr)	Circular Area Radius (m)	Initial Vertical Dimension (m)	No. Vertices (or sides)	Description
ELCBS1	AREACIRC	329539.835	5103149.17	440.69	1.52	4.87E-04	1.46E-04	10	0.7088	20	East Laydown: CBP Storage Pile 1
ELCBS2	AREACIRC	329501.44	5103148.53	440.69	1.52	4.87E-04	1.46E-04	10	0.7088	20	East Laydown: CBP Storage Pile 2
ELCBS3	AREACIRC	329456.341	5103148.17	440.69	1.52	4.87E-04	1.46E-04	10	0.7088	20	East Laydown: CBP Storage Pile 3
ELFELCB	AREAPOLY	329505.47	5103201.84	440.69	3.05	2.43E-01	2.43E-02	N/A	1.4200	5	East Laydown: Front-End Loader CBP
WLCBS1	AREACIRC	317868.672	5109756.58	561.17	1.52	4.87E-04	1.46E-04	10	0.7088	20	West Laydown: CBP Storage Pile 1
WLCBS2	AREACIRC	317913.478	5109755.61	561.17	1.52	4.87E-04	1.46E-04	10	0.7088	20	West Laydown: CBP Storage Pile 2
WLCBS3	AREACIRC	317952.172	5109754.77	561.17	1.52	4.87E-04	1.46E-04	10	0.7088	20	West Laydown: CBP Storage Pile 3
WLFELCB	AREAPOLY	317916.786	5109702.21	561.17	3.05	2.43E-01	2.43E-02	N/A	1.4200	5	West Laydown: Front-End Loader CBP

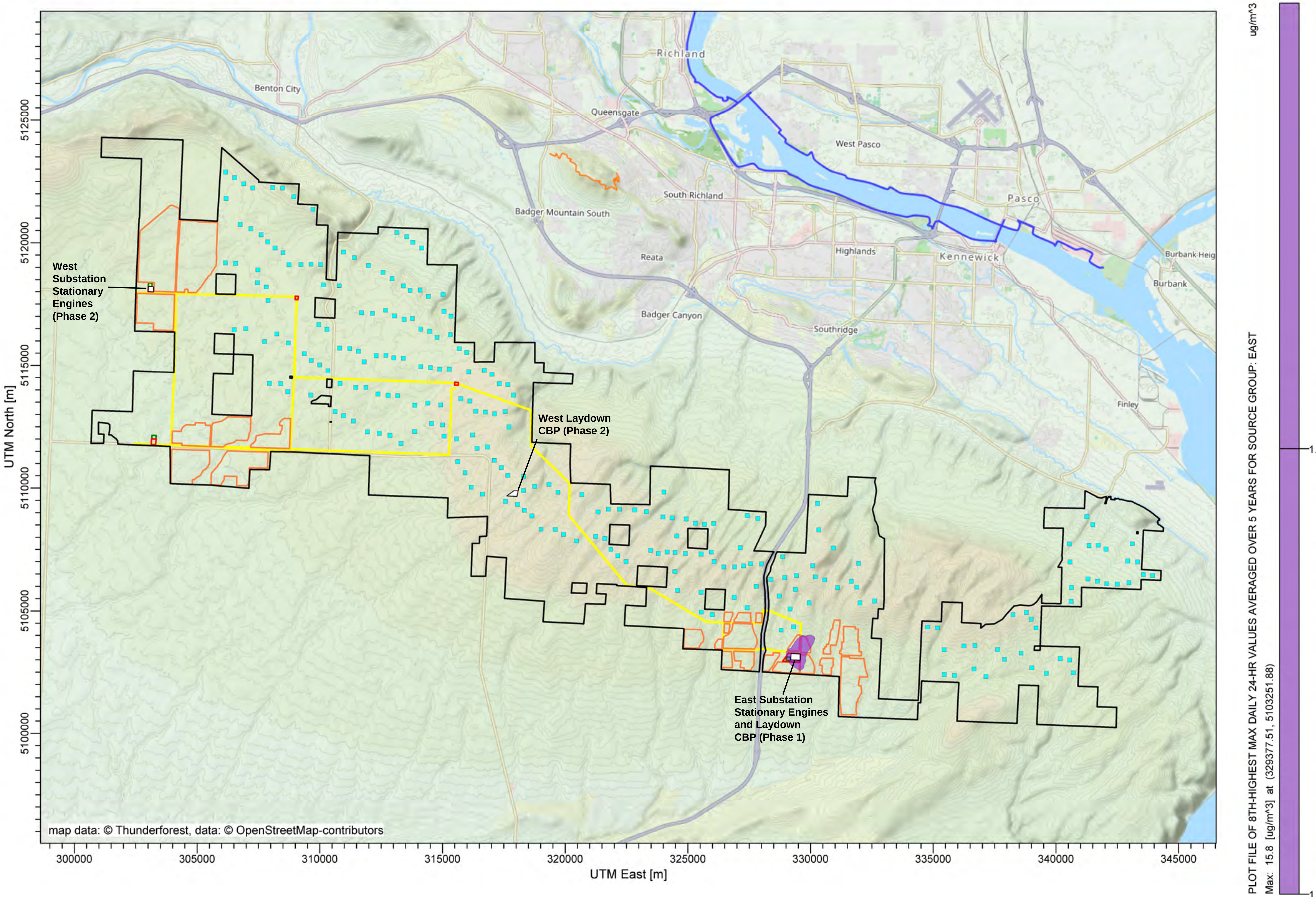
AERMOD
LINE Sources

Source ID	X Coord.	Y Coord.	Base Elevation	Release Height	PM_{10} Emission Rate	$PM_{2.5}$ Emission Rate	X2 Coordinate	Y2 Coordinate	Width	Initial Vertical Dimension	Description	Length	Area
	(m)	(m)	(m)	(m)	[g/(s-m^2)]	[g/(s-m^2)]	(m)	(m)	(m)	(m)		(m)	(m^2)
	ENTER TOTAL HAUL ROAD EMISSIONS (g/s)				**9.15E-03**	**2.25E-03**						**506.02**	**3701.62**
ELCBPRD1	329549.66	5103225.95	440.69	4.27	2.472E-06	6.07E-07	329550.32	5103240.71	17.07	13.02	East Laydown: aggregate storage piles 01	14.77	108.08
ELCBPRD2	329555.59	5103217.22	440.69	4.27	2.472E-06	6.07E-07	329549.66	5103225.95	17.07	13.02	East Laydown: aggregate storage piles 02	10.55	77.20
ELCBPRD3	329557.71	5103124.19	440.69	4.27	2.472E-06	6.07E-07	329555.59	5103217.22	17.07	13.02	East Laydown: aggregate storage piles 03	93.05	680.71
ELCBPRD4	329544.64	5103109.44	440.69	4.27	2.472E-06	6.07E-07	329557.7	5103124.19	17.07	13.02	East Laydown: aggregate storage piles 04	19.70	144.12
ELCBPRD5	329434.89	5103111.61	440.69	4.27	2.472E-06	6.07E-07	329544.29	5103109.5	17.07	13.02	East Laydown: aggregate storage piles 05	109.42	800.43
ELCBPRD6	329434.6	5103111.39	440.69	4.27	2.472E-06	6.07E-07	329427.37	5103133.45	17.07	13.02	East Laydown: aggregate storage piles 06	23.21	169.82
ELCBPRD7	329427.29	5103133.47	440.69	4.27	2.472E-06	6.07E-07	329429.4	5103229.86	17.07	13.02	East Laydown: aggregate storage piles 07	96.41	705.28
ELCBPRD8	329429.4	5103229.86	440.69	4.27	2.472E-06	6.07E-07	329429.21	5103248.42	17.07	13.02	East Laydown: aggregate storage piles 08	18.56	135.78
ELCBPRD9	329429.4	5103229.86	440.69	4.27	2.472E-06	6.07E-07	329549.66	5103225.95	17.07	13.02	East Laydown: aggregate storage piles 09	120.32	880.19
	ENTER TOTAL HAUL ROAD EMISSIONS (g/s)				**9.15E-03**	**2.25E-03**						**560.44**	**4099.76**
WLCBPRD1	317959.09	5109673.92	561.17	4.27	2.232E-06	5.48E-07	317958.97	5109662.15	17.07	13.02	West Laydown: aggregate storage piles 01	11.77	86.10
WLCBPRD2	317959.09	5109673.92	561.17	4.27	2.232E-06	5.48E-07	317970.69	5109687.12	17.07	13.02	West Laydown: aggregate storage piles 02	17.57	128.55
WLCBPRD3	317993.55	5109774.27	561.17	4.27	2.232E-06	5.48E-07	317970.68	5109687.13	17.07	13.02	West Laydown: aggregate storage piles 03	90.09	659.04
WLCBPRD4	317993.54	5109774.23	561.17	4.27	2.232E-06	5.48E-07	317982.7	5109785.49	17.07	13.02	West Laydown: aggregate storage piles 04	15.63	114.34
WLCBPRD5	317982.7	5109785.47	561.17	4.27	2.232E-06	5.48E-07	317890.81	5109793.15	17.07	13.02	West Laydown: aggregate storage piles 05	92.21	674.54
WLCBPRD6	317870.95	5109784.84	561.17	4.27	2.232E-06	5.48E-07	317890.83	5109793.13	17.07	13.02	West Laydown: aggregate storage piles 06	21.54	157.56
WLCBPRD7	317810.31	5109735.41	561.17	4.27	2.232E-06	5.48E-07	317870.95	5109784.84	17.07	13.02	West Laydown: aggregate storage piles 07	78.23	572.30
WLCBPRD8	317791.3	5109701.02	561.17	4.27	2.232E-06	5.48E-07	317810.14	5109735.45	17.07	13.02	West Laydown: aggregate storage piles 08	39.25	287.10
WLCBPRD9	317796.49	5109681.29	561.17	4.27	2.232E-06	5.48E-07	317791.34	5109701.08	17.07	13.02	West Laydown: aggregate storage piles 09	20.45	149.59
WLCBPRD10	317796.5	5109681.29	561.17	4.27	2.232E-06	5.48E-07	317796.52	5109670.44	17.07	13.02	West Laydown: aggregate storage piles 10	10.85	79.37
WLCBPRD11	317959.09	5109673.92	561.17	4.27	2.232E-06	5.48E-07	317796.41	5109681.33	17.07	13.02	West Laydown: aggregate storage piles 11	162.85	1191.27

Source ID	X Coord.	Y Coord.	Base Elevation	Release Height	PM_{10} Emission Rate	X2 Coordinate	Y2 Coordinate	Width	Initial Vertical Dimension	Description
	(m)	(m)	(m)	(m)	[g/(s-m^2)]	(m)	(m)	(m)	(m)	
	ENTER TOTAL HAUL ROAD EMISSIONS (g/s)				**0.002246**					
ELCBPRD1	329549.66	5103225.95	440.69	4.27	6.069E-07	329550.32	5103240.71	17.07	13.02	East Laydown: aggregate storage piles 01
ELCBPRD2	329555.59	5103217.22	440.69	4.27	6.069E-07	329549.66	5103225.95	17.07	13.02	East Laydown: aggregate storage piles 02
ELCBPRD3	329557.71	5103124.19	440.69	4.27	6.069E-07	329555.59	5103217.22	17.07	13.02	East Laydown: aggregate storage piles 03
ELCBPRD4	329544.64	5103109.44	440.69	4.27	6.069E-07	329557.7	5103124.19	17.07	13.02	East Laydown: aggregate storage piles 04
ELCBPRD5	329434.89	5103111.61	440.69	4.27	6.069E-07	329544.29	5103109.5	17.07	13.02	East Laydown: aggregate storage piles 05
ELCBPRD6	329434.60	5103111.39	440.69	4.27	6.069E-07	329427.37	5103133.45	17.07	13.02	East Laydown: aggregate storage piles 06
ELCBPRD7	329427.29	5103133.47	440.69	4.27	6.069E-07	329429.4	5103229.86	17.07	13.02	East Laydown: aggregate storage piles 07
ELCBPRD8	329429.40	5103229.86	440.69	4.27	6.069E-07	329429.21	5103248.42	17.07	13.02	East Laydown: aggregate storage piles 08
ELCBPRD9	329429.40	5103229.86	440.69	4.27	6.069E-07	329549.66	5103225.95	17.07	13.02	East Laydown: aggregate storage piles 09
	ENTER TOTAL HAUL ROAD EMISSIONS (g/s)				**0.002246**					
WLCBPRD1	317959.09	5109673.92	561.17	4.27	5.479E-07	317958.97	5109662.15	17.07	13.02	West Laydown: aggregate storage piles 01
WLCBPRD2	317959.09	5109673.92	561.17	4.27	5.479E-07	317970.69	5109687.12	17.07	13.02	West Laydown: aggregate storage piles 02
WLCBPRD3	317993.55	5109774.27	561.17	4.27	5.479E-07	317970.68	5109687.13	17.07	13.02	West Laydown: aggregate storage piles 03
WLCBPRD4	317993.54	5109774.23	561.17	4.27	5.479E-07	317982.7	5109785.49	17.07	13.02	West Laydown: aggregate storage piles 04
WLCBPRD5	317982.7	5109785.47	561.17	4.27	5.479E-07	317890.81	5109793.15	17.07	13.02	West Laydown: aggregate storage piles 05
WLCBPRD6	317870.95	5109784.84	561.17	4.27	5.479E-07	317890.83	5109793.13	17.07	13.02	West Laydown: aggregate storage piles 06
WLCBPRD7	317810.31	5109735.41	561.17	4.27	5.479E-07	317870.95	5109784.84	17.07	13.02	West Laydown: aggregate storage piles 07
WLCBPRD8	317791.3	5109701.02	561.17	4.27	5.479E-07	317810.14	5109735.45	17.07	13.02	West Laydown: aggregate storage piles 08
WLCBPRD9	317796.49	5109681.29	561.17	4.27	5.479E-07	317791.34	5109701.08	17.07	13.02	West Laydown: aggregate storage piles 09
WLCBPRD10	317796.5	5109681.29	561.17	4.27	5.479E-07	317796.52	5109670.44	17.07	13.02	West Laydown: aggregate storage piles 10
WLCBPRD11	317959.09	5109673.92	561.17	4.27	5.479E-07	317796.41	5109681.33	17.07	13.02	West Laydown: aggregate storage piles 11

APPENDIX C: FIGURES

Figure C-1
Horse Heaven - Air Quality Dispersion Modeling Evaluation
East Stationary Engines and Concrete Batch Plant (Phase 1) - 24-hour PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM2.5 Maximum Impact Area 55% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
15.8 ug/m^3

COMPANY NAME:

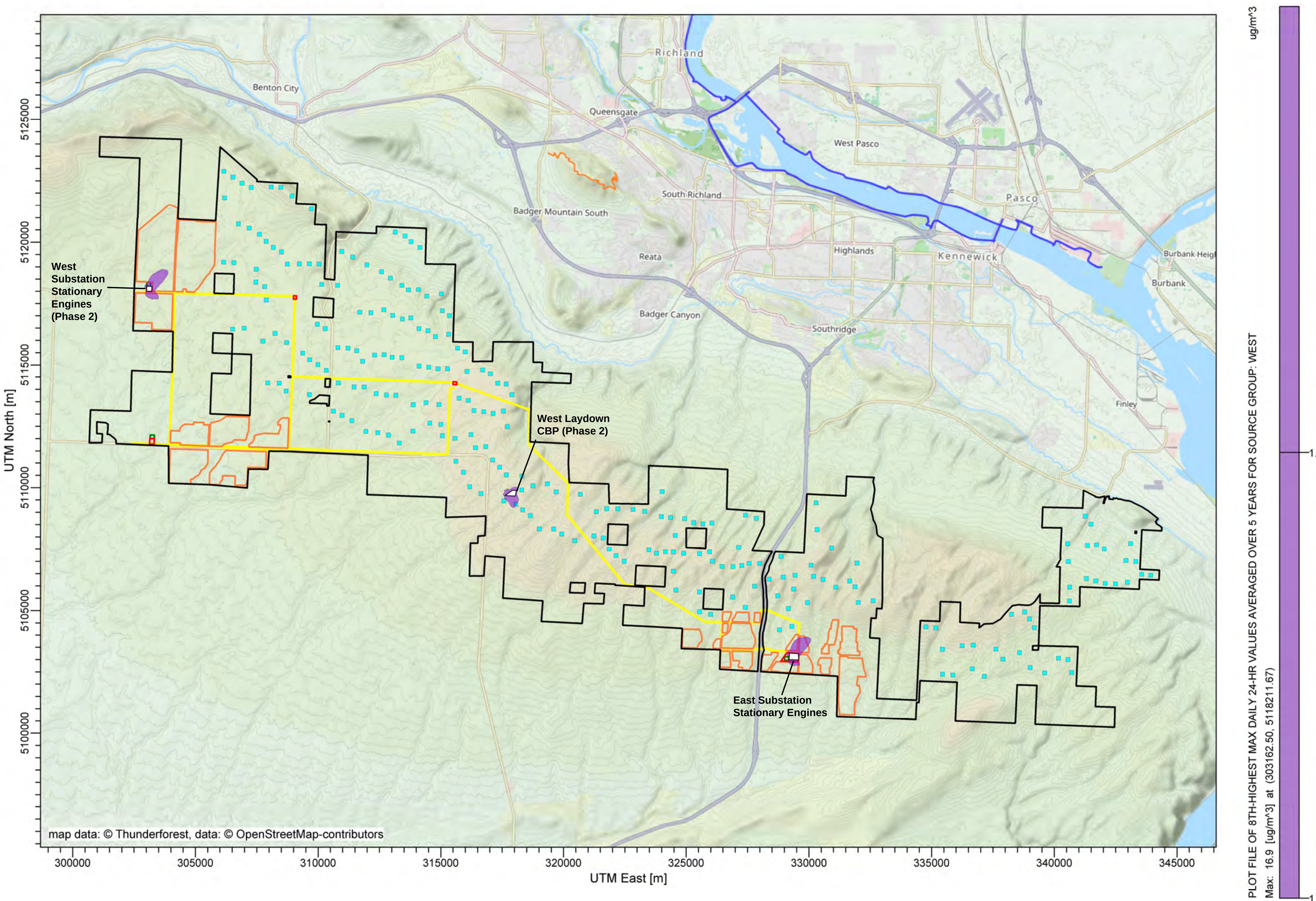
MODELER:

DATE:
6/13/2023

SCALE: 1:150,000
0 5 km

PROJECT NO.:

Figure C-2
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and West Concrete Batch Plant (Phase 2) - 24-hour PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM2.5 Maximum Impact Area 55% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
16.9 ug/m^3

COMPANY NAME:

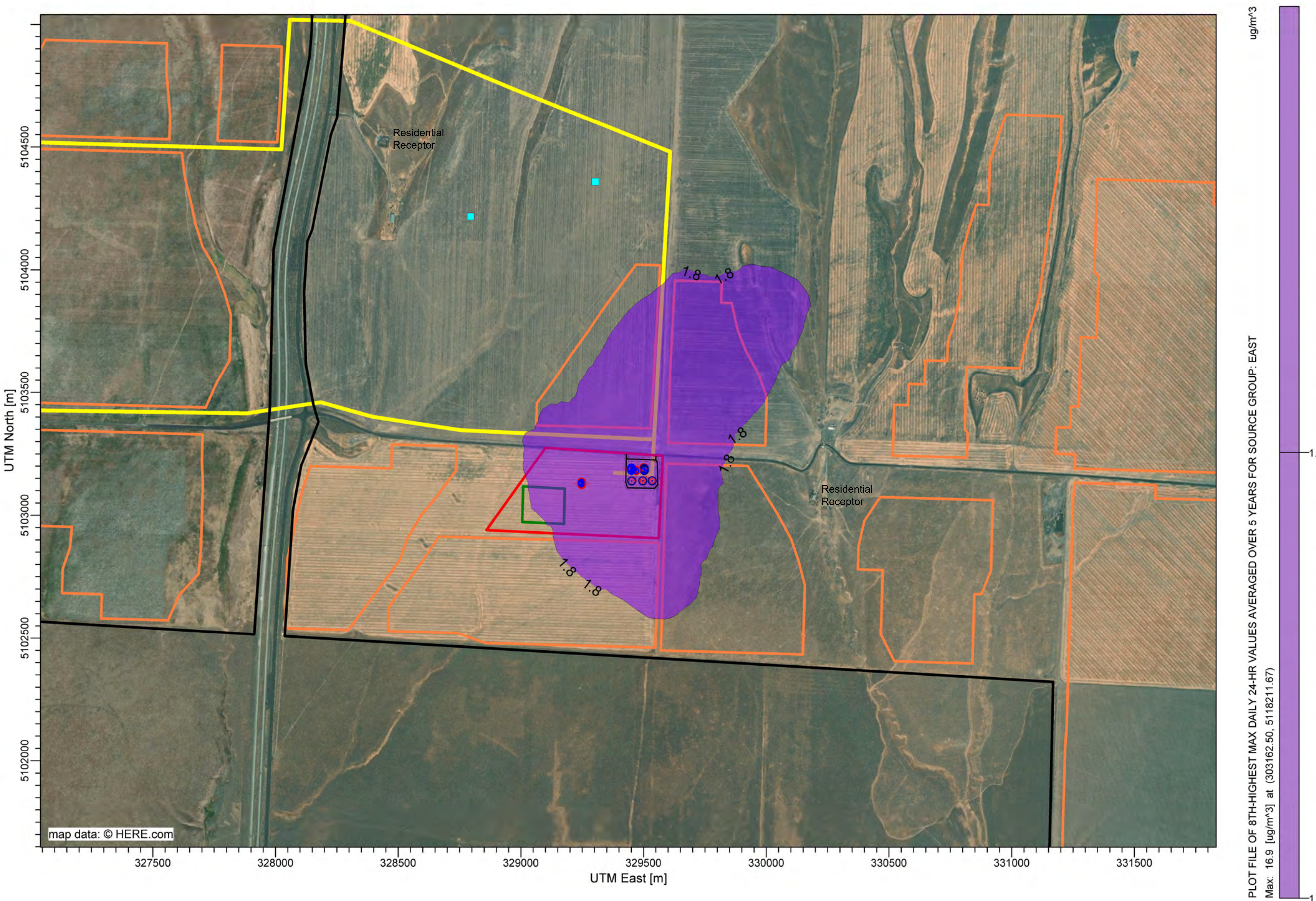
MODELER:

DATE:
6/12/2023

SCALE: 1:150,000
0 5 km

PROJECT NO.:

Figure C-3
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and East Concrete Batch Plant (Phase 1) - 24-hour PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM2.5 Maximum Impact Area 55% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
16.9 ug/m^3

COMPANY NAME:

MODELER:

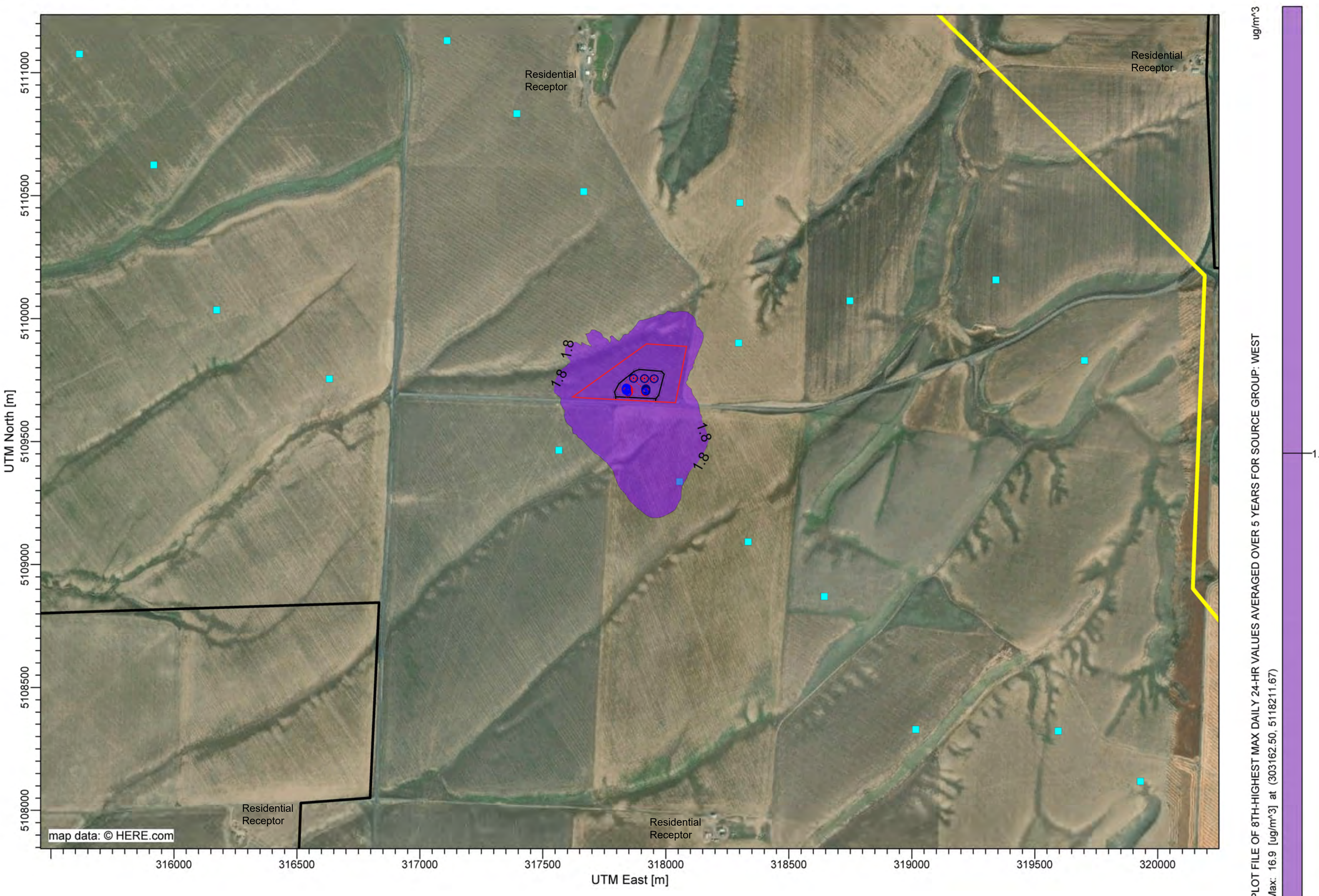
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-4
Horse Heaven - Air Quality Dispersion Modeling Evaluation
West Concrete Batch Plant (Phase 2) - 24-hour PM2.5



LEGEND

Project Boundary

Proposed Transmission Line

Option 1 Turbine Location

24-hour PM2.5 Maximum Impact Area 55% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
16.9 ug/m^3

COMPANY NAME:

MODELER:

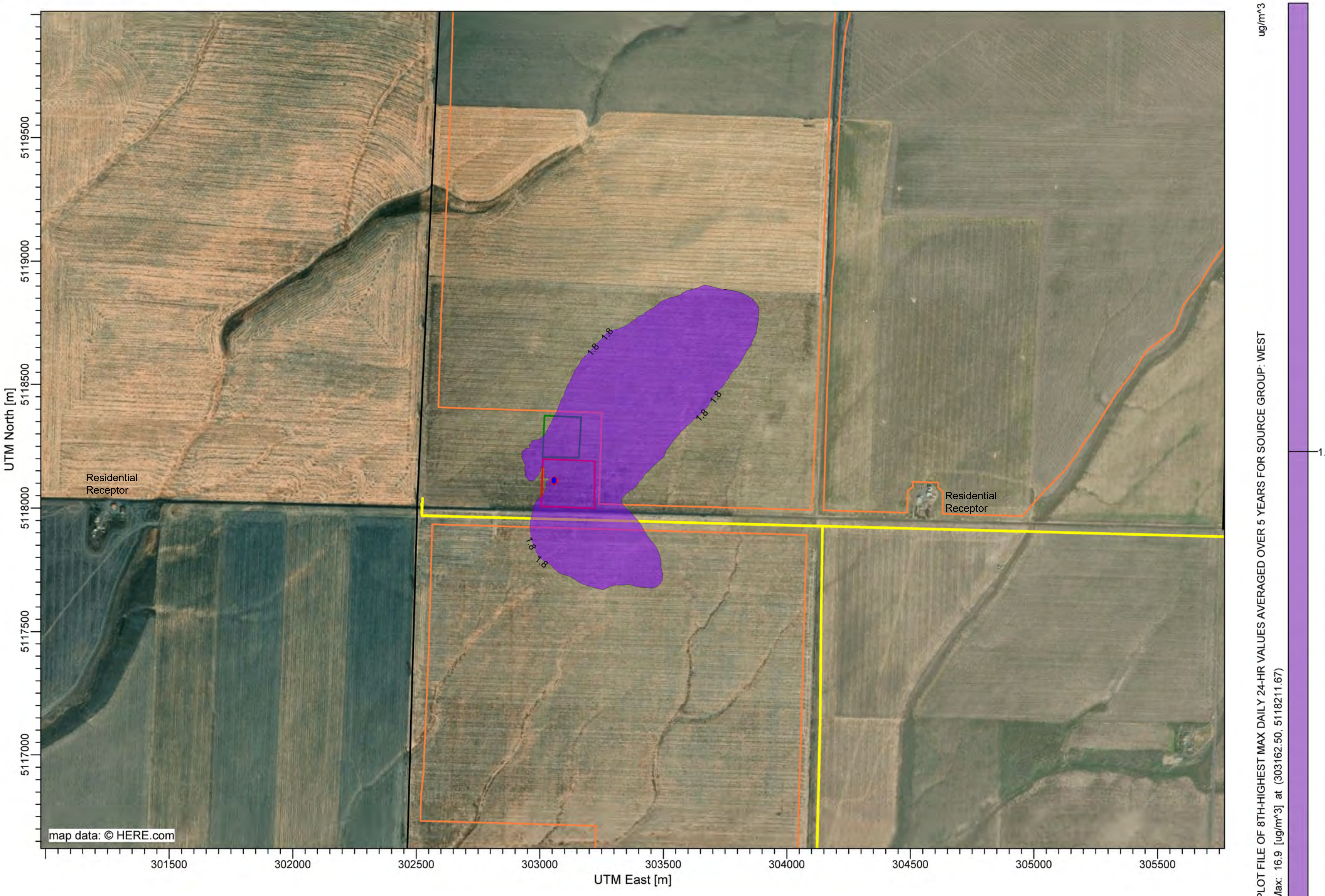
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-5
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines - West Substation - 24-hour PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- 24-hour PM2.5 Maximum Impact Area 55% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
16.9 ug/m^3

COMPANY NAME:

MODELER:

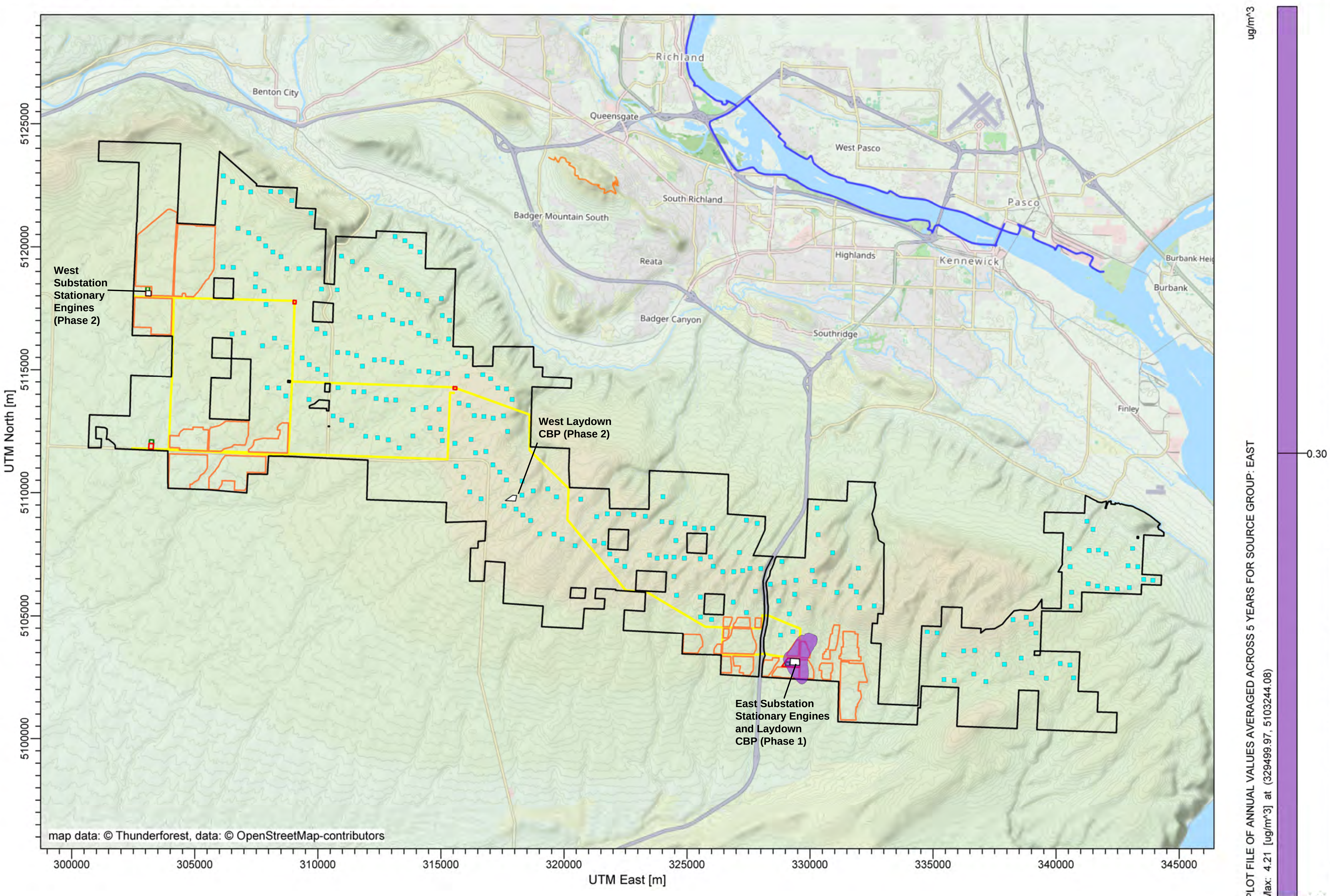
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-6
Horse Heaven - Air Quality Dispersion Modeling Evaluation
East Stationary Engines and Concrete Batch Plant (Phase 1) - Annual PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- Annual PM2.5 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
4.21 ug/m^3

COMPANY NAME:

MODELER:

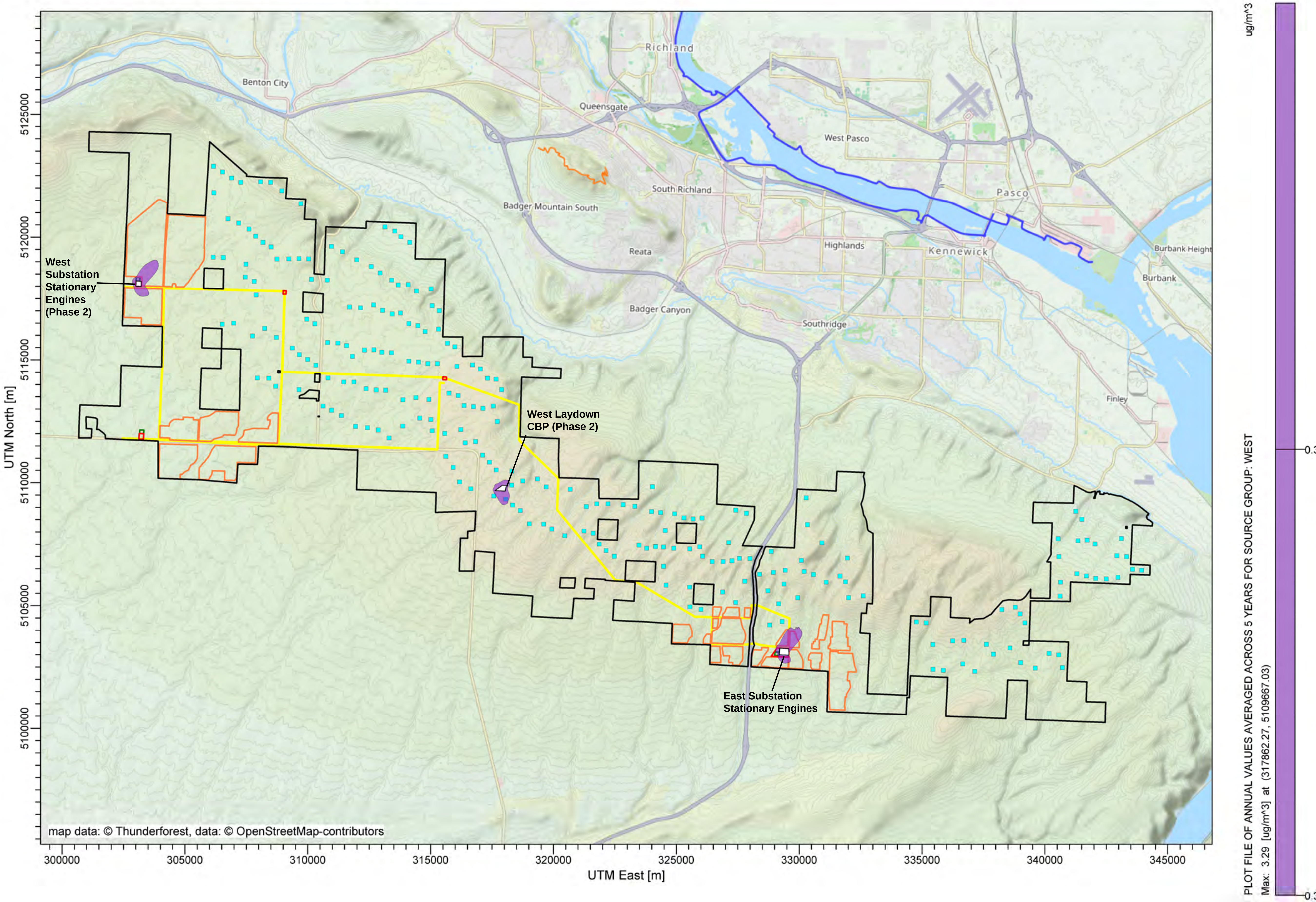
DATE:
6/13/2023

SCALE: 1:150,000
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-7
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and West Concrete Batch Plant (Phase 2) - Annual PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- Annual PM2.5 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
3.29 ug/m^3

COMPANY NAME:

MODELER:

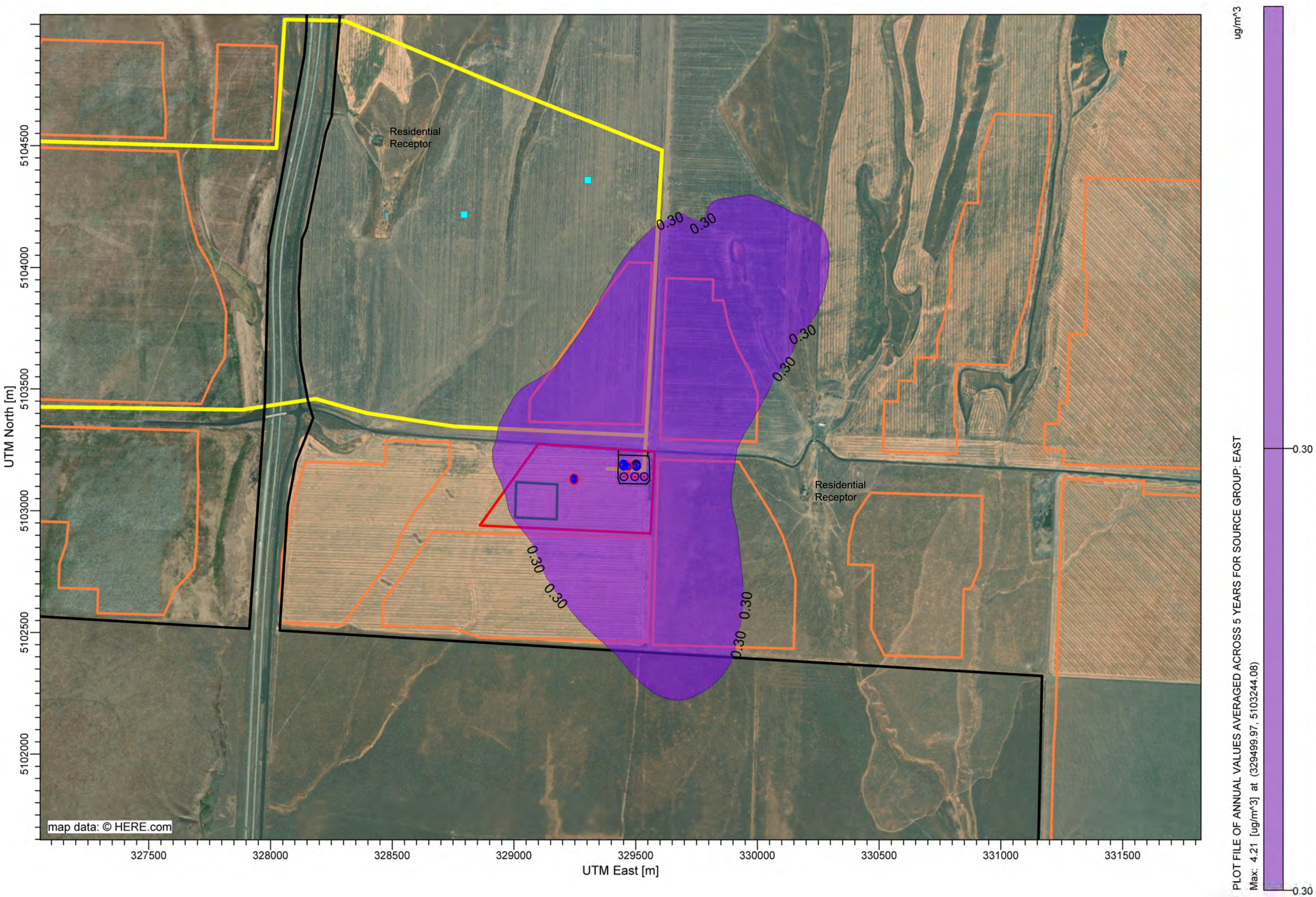
DATE:
6/12/2023

SCALE: 1:150,000

0 5 km

PROJECT NO.:

Figure C-8
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and East Concrete Batch Plant (Phase 1) - Annual PM2.5



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- Annual PM2.5 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
4.21 ug/m^3

COMPANY NAME:

MODELER:

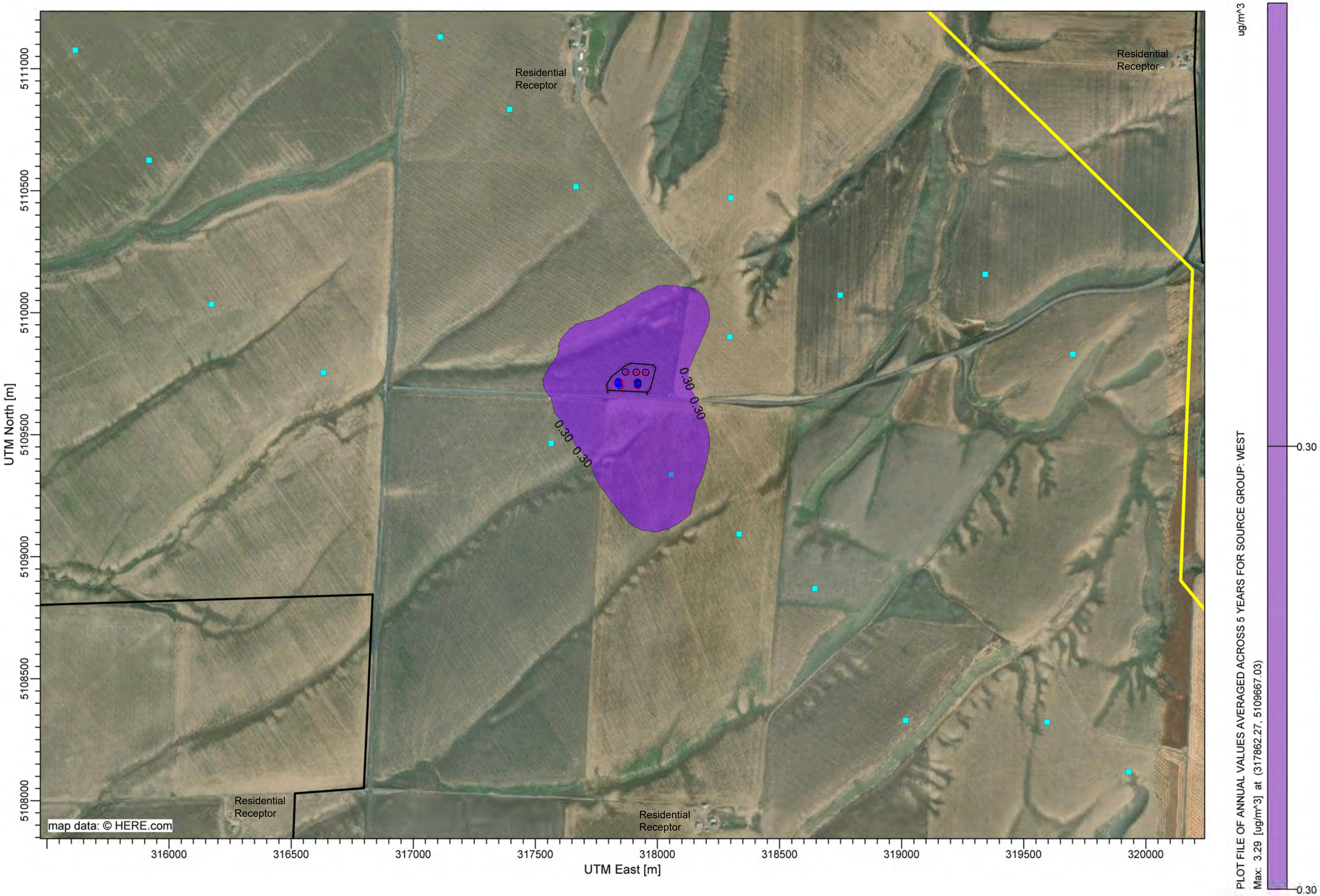
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-9
Horse Heaven - Air Quality Dispersion Modeling Evaluation
West Concrete Batch Plant (Phase 2) - Annual PM2.5



LEGEND

- Project Boundary
- Proposed Transmission Line
- Option 1 Turbine Location
- Annual PM2.5 Maximum Impact Area 50% of NAAQS

SOURCES:	56
RECEPTORS:	20275
OUTPUT TYPE:	Concentration
MAX:	3.29 ug/m^3
COMPANY NAME:	
MODELER:	
DATE:	6/12/2023
SCALE:	1:15,000 (0 – 0.4 km)
PROJECT NO.:	

AERMOD View - Lakes Environmental Software

Figure C-10
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines - West Substation - Annual PM2.5

LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Annual PM2.5 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
3.29 ug/m^3

COMPANY NAME:

MODELER:

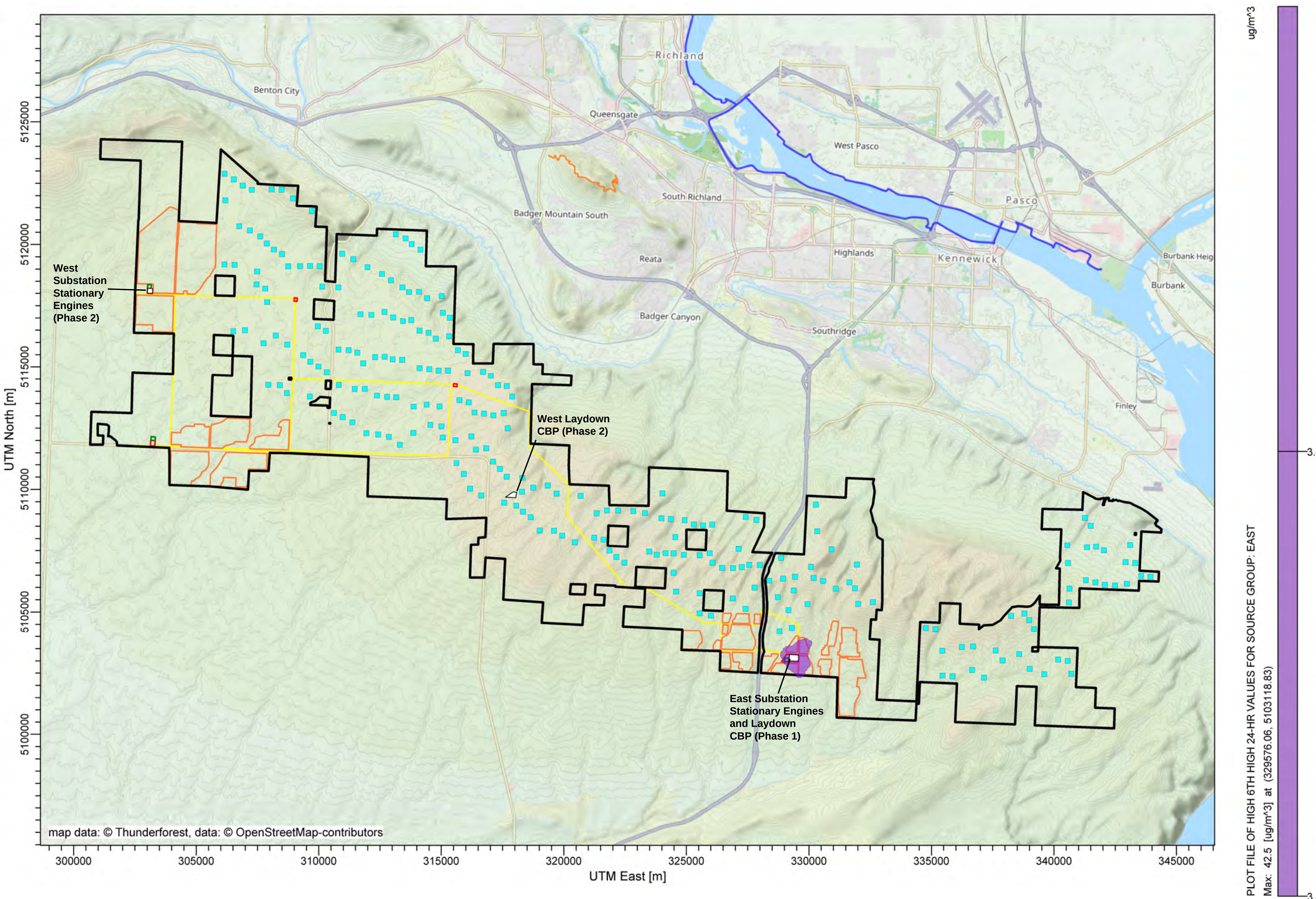
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-11
Horse Heaven - Air Quality Dispersion Modeling Evaluation
East Stationary Engines and Concrete Batch Plant (Phase 1) - 24-hour PM10



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM10 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
42.5 ug/m^3

COMPANY NAME:

MODELER:

DATE:
6/13/2023

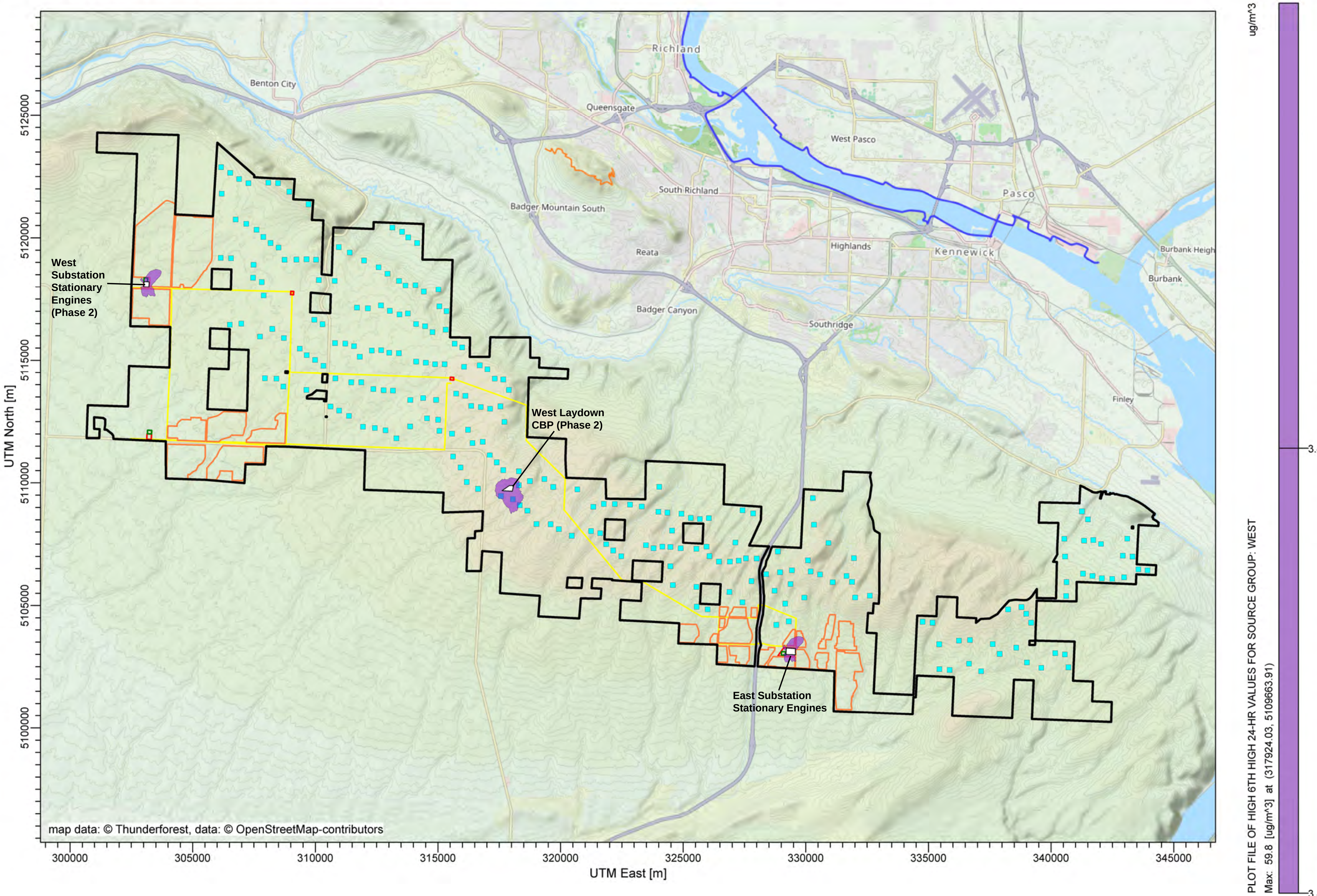
SCALE: 1:150,000

0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-12
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and West Concrete Batch Plant (Phase 2) - 24-hour PM10



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM10 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
59.8 ug/m^3

COMPANY NAME:

MODELER:

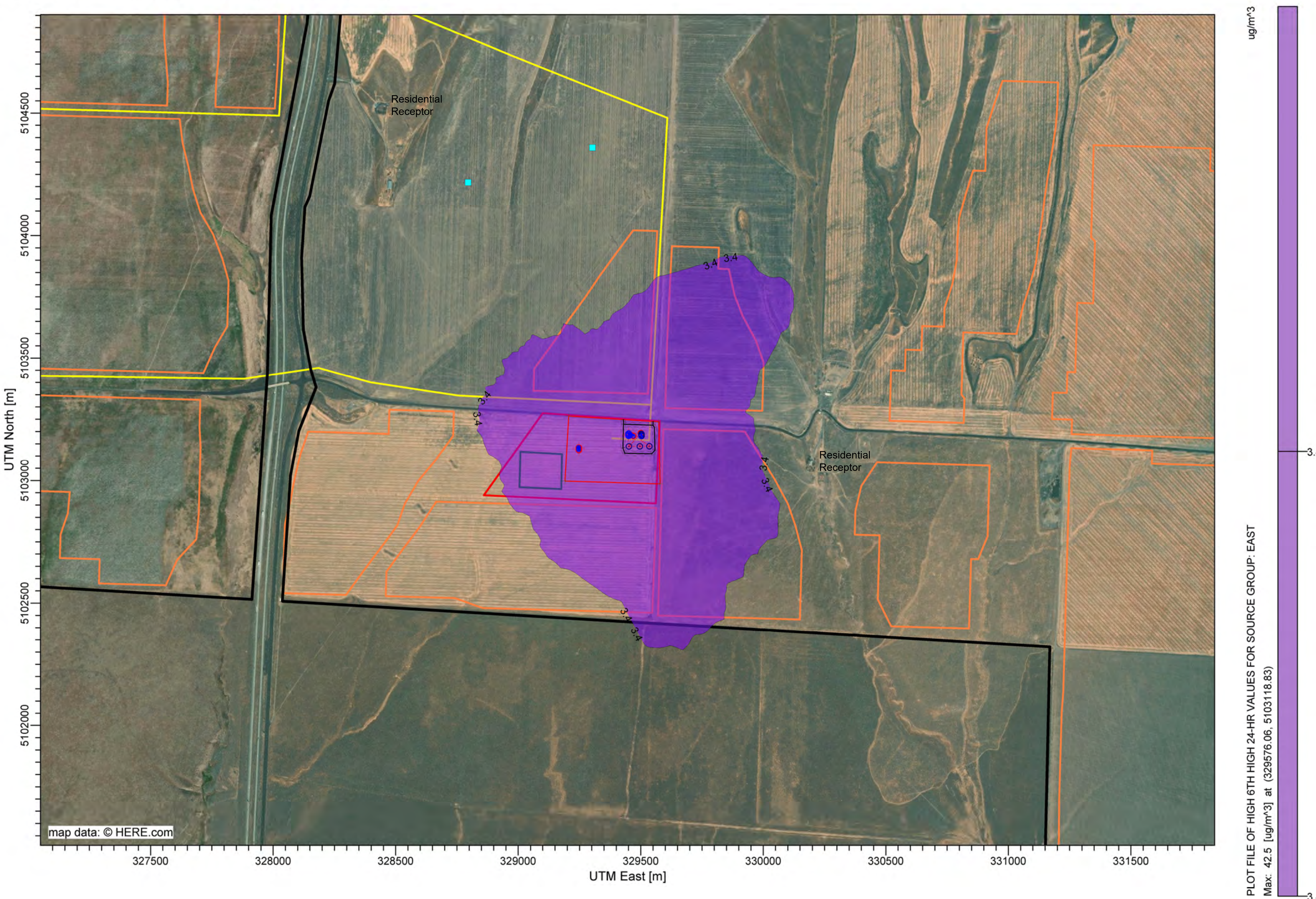
DATE:
6/12/2023

SCALE: 1:150,000
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-13
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and East Concrete Batch Plant (Phase 1) - 24-hour PM10



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM10 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
42.5 ug/m^3

COMPANY NAME:

MODELER:

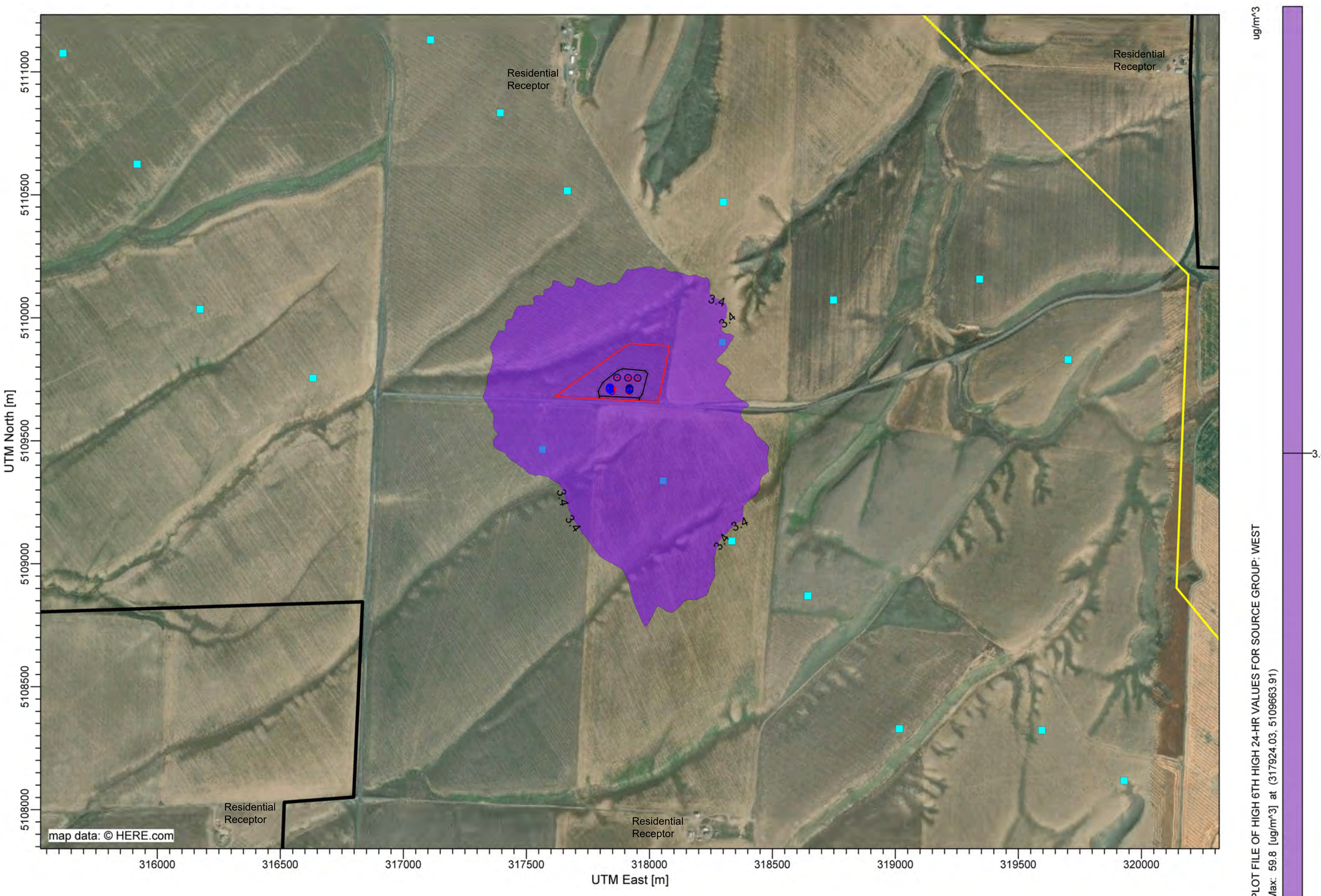
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-14
Horse Heaven - Air Quality Dispersion Modeling Evaluation
West Concrete Batch Plant (Phase 2) - 24-hour PM10



LEGEND

- Project Boundary
- Proposed Transmission Line
- Option 1 Turbine Location
- 24-hour PM10 Maximum Impact Area 50% of NAAQS

SOURCES:
56

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
59.8 ug/m^3

COMPANY NAME:

MODELER:

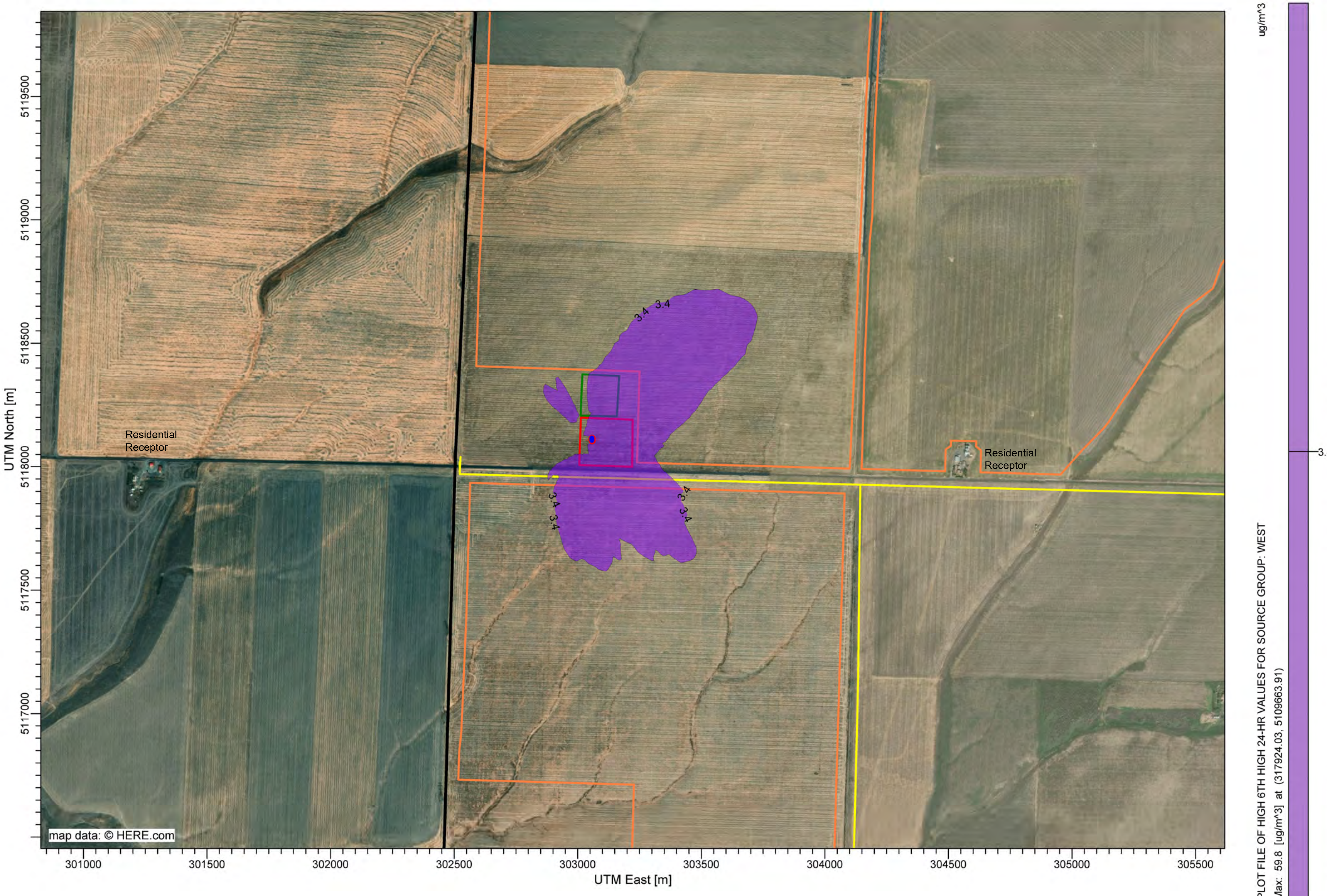
DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-15
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines - West Substation - 24-hour PM10

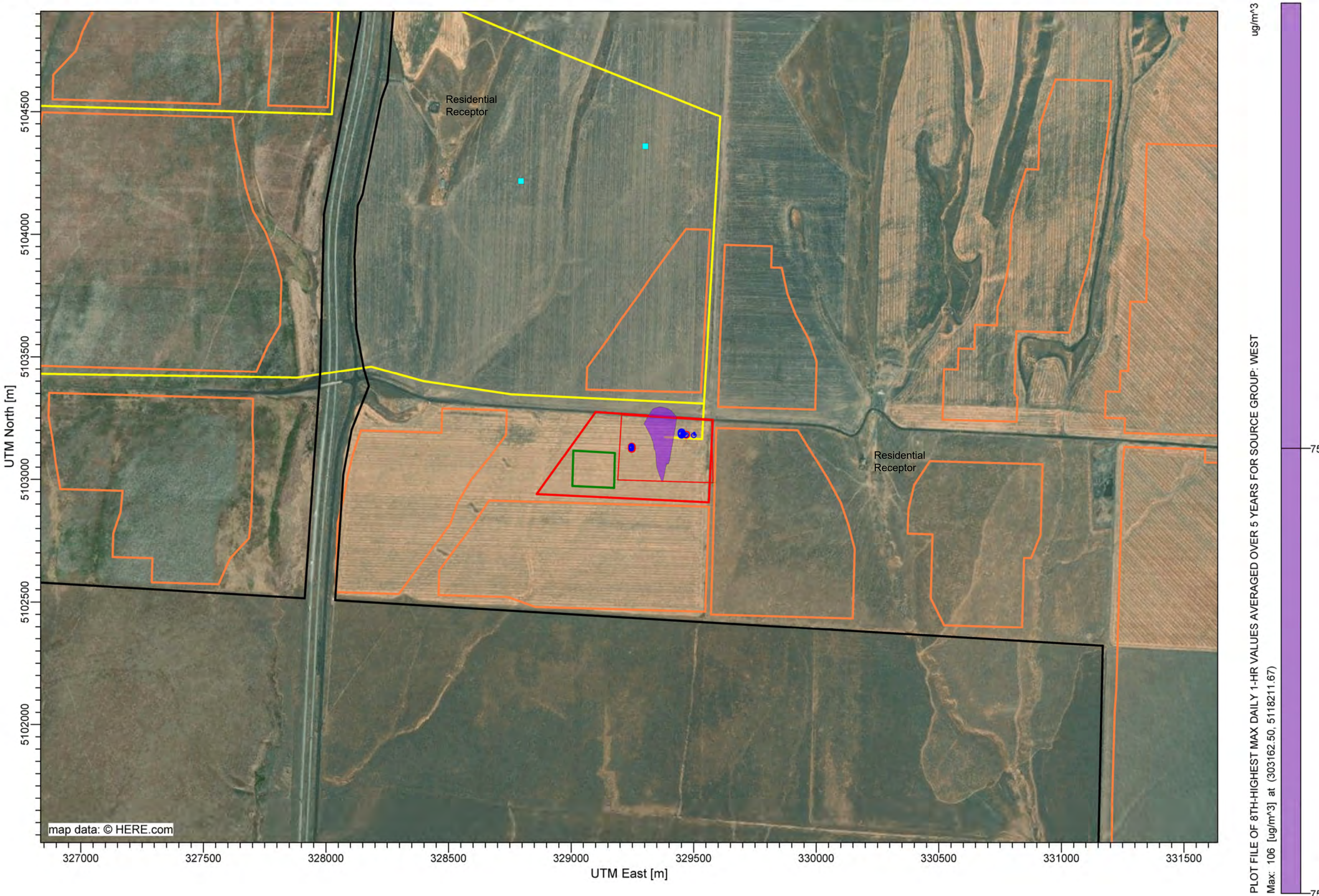


LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- 24-hour PM10 Maximum Impact Area 50% of NAAQS

SOURCES:	56
RECEPTORS:	20275
OUTPUT TYPE:	Concentration
MAX:	59.8 ug/m^3
COMPANY NAME:	
MODELER:	
DATE:	6/12/2023
SCALE:	1:15,000 (0 – 0.4 km)
PROJECT NO.:	

Figure C-16
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines and East Concrete Batch Plant (Phase 1) - 1-hour NO2



LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- Option 1 Turbine Location
- 1-hour NO2 Maximum Impact Area 50% of NAAQS

SOURCES:
8

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
106 ug/m^3

COMPANY NAME:

MODELER:

DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-17
Horse Heaven - Air Quality Dispersion Modeling Evaluation
West Concrete Batch Plant (Phase 2) - 1-hour NO2

LEGEND

Project Boundary

Proposed Transmission Line

Option 1 Turbine Location

1-hour NO2 Maximum Impact Area 50% of NAAQS (no areas with greater than 50% of NAAQS)

SOURCES:
8

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
106 ug/m^3

COMPANY NAME:

MODELER:

DATE:
6/12/2023

SCALE: 1:15,000

0 0.4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

Figure C-18
Horse Heaven - Air Quality Dispersion Modeling Evaluation
Stationary Engines - West Substation - 1-hour NO2

LEGEND

- Project Boundary
- Solar Siting Area
- Proposed BESS
- Proposed Substation
- Proposed Transmission Line
- 1-hour NO2 Maximum Impact Area 50% of NAAQS

SOURCES:
8

RECEPTORS:
20275

OUTPUT TYPE:
Concentration

MAX:
106 ug/m^3

COMPANY NAME:

MODELER:

DATE:
6/12/2023

SCALE: 1:15,000
0 0.4 km

PROJECT NO.:

APPENDIX 4.6-1

GAL 2022 Wind Turbine Wildlife Collision Risk Assessment

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GOLDER
MEMBER OF WSP

REPORT

Wind Turbine Wildlife Collision Risk Assessment

Horse Heaven Wind Farm

Submitted to:

Horse Heaven Wind Farm, LLC

5775 Flatiron Parkway, Suite 120
Boulder, CO 80301

Submitted by:

Golder Associates Ltd.

Suite 200 - 2920 Virtual Way, Vancouver, British Columbia, V5M 0C4, Canada

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April 2022

Executive Summary

Horse Heaven Wind Farm, LLC (the Applicant) is proposing to develop the Horse Heaven Wind Farm (the Project) in Benton County, Washington. The Applicant is considering two general turbine options comprising four different turbine technologies. The four turbine technologies presented in the Application for Site Certification are examples of available technologies and are not prescriptive of what might be available at the time of construction. Under Option 1, turbines would be shorter and have a smaller rotor diameter than under Option 2. Option 2 would involve fewer turbines because each turbine would have a higher energy production capability. This special study report compares the potential bird and bat collision risk associated with each turbine option based on existing information collected during baseline studies conducted for the Project and a review of published scientific literature pertaining to bird and bat interactions with wind turbines.

Baseline studies conducted by the Applicant considered in this special study report are avian use surveys (AUS) and acoustic bat surveys. AUS were conducted for the Project and used to determine a relative index of bird exposure, which is a relative measure of species-specific risk to turbine collisions that considers each species' local abundance, proportion of observations in flight, and observed flight heights. Exposure indices are available for eight special status bird species and were compared between turbine technologies to evaluate relative collision risk.

Acoustic bat surveys were conducted by the Applicant to estimate bat activity levels within the Project area during the known regional period of bat activity. Acoustic detectors were deployed at four sites in and around the Project Lease Boundary with paired microphones placed near ground level and approximately 148 feet (45 m) above ground level on a meteorological tower. Eight bat species were documented during acoustic bat surveys in and around the Lease Boundary. Most recorded bat passes were produced by three low-frequency bat species: silver-haired bat *(Lasionycteris noctivagans)*, hoary bat *(Lasiurus cinereus)*, and big brown bat *(Eptesicus fuscus)*.

The literature review suggests that the effect of turbine height and rotor swept area on bird collision mortalities remains uncertain (AWWI 2021). Some studies did not find a relationship between bird mortality rates and turbine height (Everaert 2014; Barclay et al. 2007; Krijgsveld et al. 2009). Other studies report higher bird mortality rates at taller turbines on a per turbine basis (Loss et al. 2013; De Lucas et al. 2008, Thelander et al. 2003) but lower mortality rates per unit of energy generation (Thaxter et al. 2017), although this is not unequivocal (Huso et al. 2021). Nevertheless, replacing several small turbines with fewer larger turbines has been hypothesized to reduce bird collision risk, particularly for raptors (Arnett and May 2016; Dahl et al. 2015; Thaxter et al. 2017).

Collision with turbines is considered one of the greatest threats to bats in North America (O'Shea et al. 2016). Three species of migratory tree-roosting bats (i.e., eastern red bat *[Lasiurus borealis]*, silver-haired bat, hoary bat) make up most bat mortalities resulting from turbine collision, raising concerns about population-level impacts as the number of wind farms increases (Barclay et al. 2007; Zimmerling and Francis 2016; Hein and Schirmacher 2016). However, there is limited and conflicting information about the effect of turbine height on bat collision mortalities. Some studies report that bat mortality rates increase with turbine size (Baerwald and Barclay 2009), including on a per megawatt (MW) basis (Barclay et al. 2007), while others report no effect (Huso et al. 2021), the opposite effect (Fielder et al. 2007), or that mortality rates increase on either side of an optimum intermediate turbine size (Thaxter et al. 2017).

The following provides a summary of anticipated wildlife collision risk associated with the two turbine options based on information collected during baseline studies and a review of available published scientific literature:

- Based on AUS data:
  - Mean exposure indices for small bird species were highest at the GE 3.03-MW turbines (Option 1) and similar across the three other turbine technologies. Therefore, Option 1 is expected to result in a greater number of small bird mortalities.
  - Among large bird species, exposure indices for raptors were higher for shorter turbines (Option 1), but exposure indices for waterfowl were higher at taller turbines (Option 2). It is expected that the option requiring a greater number of shorter turbines (Option 1) would result in more large bird mortalities because raptors appear more susceptible to turbine collisions than waterfowl (AWWI 2021).
  - Option 1 is expected to result in greater collision risk for six of the eight special status bird species observed during AUS (ferruginous hawk *[Buteo regalis]*, golden eagle *[Aquila chrysaetos]*, prairie falcon *[Falco mexicanus]*, tundra swan *[Cygnus columbianus]*, American white pelican *{Pelecanus erythrorhycnhos]*, great blue heron *[Ardea herodias]*). Exposure indices were highest for Option 2 technologies for two special status bird species (sandhill crane *[Grus canadensis]*, bald eagle *[Haliaeetus leucocephalus]*), but it is uncertain to what degree this may be offset by fewer turbines.
- Based on a literature review, the weight of evidence suggests that per unit of energy output, a wind farm layout with fewer larger turbines (i.e., Option 2) is likely to have fewer total bird mortalities than one with a greater number of smaller turbines (i.e., Option 1).
- The relationship between turbine height and bat collision mortalities is too inconclusive to make confident predictions regarding which turbine option is expected to result in fewer bat mortalities.

It is important to acknowledge that there is uncertainty associated with these conclusions related to conflicting results in available published scientific studies, lack of studies at turbines within the range of heights considered for the Horse Heaven Wind Farm, and potential for substantial variability in wildlife mortality based on local factors (e.g., bird abundance, species composition, topography, habitat, spatial arrangement of turbines). These sources of uncertainty limit the confidence of predicted wildlife mortality risk associated with the two turbine options.

Table of Contents

1.0 INTRODUCTION

Horse Heaven Wind Farm, LLC (the Applicant) is proposing to develop the Horse Heaven Wind Farm (the Project) in Benton County, Washington. The Applicant is considering two general turbine options comprising four different turbine technologies to facilitate flexible turbine siting (Table 1). The turbine technologies are examples of available technologies and are not prescriptive of what might be available at the time of construction. Under Option 1, turbines would be shorter and have a smaller rotor diameter than under Option 2. Option 2 would involve fewer turbines because each turbine would have a higher energy production capability. Golder Associates Ltd. (Golder) was retained to complete this special study report comparing the potential bird and bat collision risk associated with each turbine option.

2.0 METHODS

Each turbine option has two possible turbine technologies (see Table 1). The specifications for each type served as the basis for evaluating bird and bat collision risk associated with Option 1 and Option 2.

Table 1: Potential Turbine Specifications

Turbine Parameters/Features	Turbine Option 1		Turbine Option 2	
	GE 2.82 MW Turbine	GE 3.03 MW Turbine	GE 5.5 MW Turbine	SG 6.0 MW Turbine
Tower Type	Tubular	Tubular	Tubular	Tubular steel / hybrid
Maximum Number of Turbines Considered	244	244	150	150
Turbine Rotor Diameter	127 m / 417 ft	140 m / 459 ft	158 m / 518 ft	170 m /557 ft
Turbine Hub Height (ground to nacelle)	89 m / 292 ft	81 m / 266 ft	125 m / 411 ft	113 m / 377 ft
Maximum Total Height (ground to blade tip)	152 m / 499 ft	151 m / 496 ft	204 m / 671 ft	200 m / 657 ft
Tower Base Diameter	4.6 m / 15.1 ft	4.6 m / 15.1 ft	4.6 m / 15.1 ft	4.7 m / 15.5 ft

Source: Table 2.3-1 of the Application for Site Certification (Horse Heaven Wind Farm, LLC 2021)

ft = feet; GE = General Electric; MW = megawatts; m = meters; SG = Siemens Gamesa

Bird and bat collision risk associated with the two general turbine options was evaluated based on site-specific information collected during baseline studies conducted for the Project and presented in the Application for Site Certification (ASC) to the Washington Energy Facility Site Evaluation Council (Horse Heaven Wind Farm LLC, 2021), in combination with a review of published scientific literature pertaining to bird and bat interactions with wind turbines.

2.1 Baseline Studies

The following sections provide an overview of baseline studies conducted for the Project and how those data were used in this special study report. For detailed information related to baseline wildlife studies, refer to Section 3.4.1.3 of the ASC and Appendices K and M to the ASC (Horse Heaven Wind Farm, LLC 2021).

2.1.1 Avian Use Surveys

Avian use surveys (AUS) were conducted for the Project from 2017 to 2020 to document temporal and spatial use of the Lease Area by small and large bird species. AUS consisted of 10-minute, 100-meter (m) circular plot point counts for small birds and 60-minute, 800-m circular plot point counts for large birds. During both survey methodologies, biologists recorded the bird species observed, number of individuals, distance, flight height and direction, and habitat types.

Data from AUS conducted during all years, survey areas, and seasons were aggregated to calculate a relative index of bird exposure, *R*, which is a relative measure of species-specific risk of turbine collision, using the following formula:

$$R = A \times P_f \times P_t$$

- *A* equals the mean relative use (i.e., average number of observations per survey plot) for a particular species (i.e., species *i*). Mean relative use was calculated by summing the total number of observations within each plot during a visit, then averaging across all survey plots within each visit, followed by averaging across visits within each season, and finally averaging seasonal values weighted by the number of days in each season;
- P_f equals the proportion of all observations of species *i* where activity was recorded as flying; and
- P_t equals the proportion of all initial flight height observations of species *i* within the rotor swept height for the proposed turbine.

The exposure index provides a relative measure of species-specific collision risk with a wind turbine at the Project based on their local abundance, proportion of flying observations, and flight heights. The exposure index can also be used to compare relative collision risk for a particular species between turbines with different rotor swept zones. A greater exposure index value represents higher collision risk. For example, a species with an exposure index of 0.20 is ten times more likely to be exposed to collision with a wind turbine than a species with an exposure index of 0.02. However, the exposure index is not directly translatable to the number of bird mortalities. This is partly because it does not take into consideration habitat selection, flight movements relative to proposed turbine siting, or species-specific ability to detect and avoid turbines.

Exposure indices for Option 1 and Option 2 turbine technologies were compared to evaluate bird collision risk. However, the relative index of exposure does not consider the number of turbines required for each option. If the exposure index for Option 1 technologies is greater than for Option 2 technologies, it was assumed that the overall collision risk for Option 1 is also greater because it consists of a larger number of turbines. However, the opposite does not necessarily hold true. If the exposure index for Option 2 technologies is greater than Option 1 technologies, collision risk could still be offset by fewer turbines, depending on the magnitude of the differences in the exposure indices and the number of turbines. Unfortunately, there is no clear mathematical relationship between the exposure index and number of turbines. Therefore, assessment of mortality risk based on exposure indices was evaluated qualitatively.

2.1.2 Acoustic Bat Surveys

The objective of acoustic bat surveys was to estimate bat activity levels within the Project area during the known regional period of bat activity. Acoustic surveys were conducted at four sites in and around the Project Lease Boundary from August through October in 2017 and from May through October in 2018 using a combination of Anabat SD2 Active Bat Detector and Wildlife Acoustic Song Meter SM3 full-spectrum acoustic detectors. At each site, one microphone was deployed near ground level, at approximately 5 feet (1.5 m) above ground level, and another was raised on the same meteorological tower to approximately 148 feet (45 m) above ground level. Three detector sites were in grassland habitat and one detector site was in shrub-steppe habitat. Bat activity recorded at detectors was summarized as the number of total passes, as well as passes by high-frequency (>30 kilohertz [kHz]) and low-frequency (<30 kHz) bat groups.

The relationship between pre-construction bat acoustic activity and post-construction bat mortality rates at wind farms has been debated in scientific literature (Hein et al. 2013). Based on an analysis of paired pre- and post-construction studies from 49 wind farms in the United States and Canada, Solick et al. (2020) found that pre-development bat activity rates did not predict bat mortality rates during operation. A possible explanation for the lack of a predictive relationship is that some bat species may be attracted to wind turbines as hypothesized by several studies (AWWI 2021; Arnett and May 2016; Guest et al. 2022). There is uncertainty around the causes of attraction and information at the species-level is limited (Guest et al. 2022). Therefore, information from acoustic bat surveys was primarily used to focus the literature review on bat species present within the Project Lease Boundary instead of attempting to use pre-construction bat activity as a predictor of bat mortality.

3.0 RESULTS

3.1 Birds

3.1.1 Avian Use Studies

Species-specific exposure indices derived from AUS are presented in Appendix A. The exposure indices represent relative collision risk but are not directly translatable to the number of bird mortalities due to factors such as species-specific collision avoidance.

3.1.1.1 Small Bird Species

The number of small bird species with non-zero exposure indices for each turbine technology was nine species for the GE 2.82-megawatt (MW) turbine (Option 1), 16 species for the General Electric (GE) 3.03-MW turbine (Option 1), two species at the GE 5.5-MW turbine (Option 2), and six species at the Siemens Gamesa (SG) 6.0-MW turbine (Option 2). Non-zero species-specific mean exposure indices were highest for all small bird species at the GE 3.03-MW turbines (Option 1) and similar across the three other turbine technologies. Exposure indices were generally low, ranging from 0.001 to 0.312 for all species and turbine technologies, except for horned lark (*Eremophila alpestris*) at the Option 1, GE 3.03 MW turbines (exposure index of 1.275). Based on these exposure indices, it is expected that collision risk for small bird species would be greater for Option 1 technologies, especially the GE 3.03-MW turbine, than Option 2 technologies. Because Option 1 would require a greater number of turbines than Option 2, it is also expected that small bird mortalities would be greater under Option 1 than Option 2. Studies show that, for small passerine (i.e., songbird) species, turbine-related mortalities resulting from currently developed wind farms constitute a small percentage of their total population size (<0.045%) (Erickson et al. 2014) and do not appear likely to lead to population-level impacts (AWWI 2021).

3.1.1.2 Large Bird Species

The number of large bird species with non-zero exposure indices was similar for all turbine technologies, ranging from 34 species for the GE 3.03-MW turbine (Option 1) to 29 species for the GE 5.5-MW turbine (Option 2). In general, exposure indices for raptors were higher for shorter turbines than taller turbines. Conversely, exposure indices for waterfowl (i.e., ducks, geese, and swans) were higher at taller turbines. However, mortalities of waterbirds and waterfowl are relatively infrequent at land-based wind farms, whereas diurnal raptors appear more susceptible (AWWI 2021). Therefore, it is expected that the option requiring a greater number of shorter turbines (Option 1) would result in a greater number of large bird mortalities. Large bird species that are slow to mature and have a low reproductive rate may be more susceptible to population-level impacts from collision mortality (Watson et al. 2018). Demographic modeling suggests potential for population-level impacts for some raptor species, including ferruginous hawk *(Buteo regalis)* and golden eagle *(Aquila chrysaetos)*, based on future wind energy projections (Diffendorfer et al. 2021).

3.1.1.3 Special Status Bird Species

Conservation status of wildlife species reflects their existing population size and trends. Special status bird species are likely less resilient to population declines, and it is prudent to consider their species-specific potential for collision mortality associated with the two turbine options. For the purposes of the ASC, special status bird species were defined as species listed under the U.S. Endangered Species Act, state-listed endangered species, state-listed threatened species, state-listed sensitive species, state-listed candidate species, Washington Department of Fish and Wildlife priority species, and eagles (Horse Heaven Wind Farm LLC, 2021). Fourteen special status bird species have potential to occur within the Project Lease Boundary, with 13 species documented in the Project Lease Boundary (Horse Heaven Wind Farm LLC, 2021). Mean exposure indices from AUS conducted for the Project are available for eight special status bird species. Mean exposure indices are not available for the following six special status bird species: burrowing owl *(Athene cunicularia)*, loggerhead shrike *(Lanius ludovicianus)*, ring-necked pheasant *(Phasianus colchicus)*, sagebrush sparrow *(Artemisiospiza nevadensis)*, sage thrasher *(Oreoscoptes montanus)*, and Vaux's swift *(Chaetura vauxi).* For the eight species with data, the exposure indices for the different turbine technologies under consideration for the Project are discussed below and summarized in Table 2.

- American white pelican *(Pelecanus erythrorhycnhos)*: Exposure indices for American white pelican are similar for all turbine technologies, ranging from 0.289 for Option 1 technologies to 0.303 for Option 2 technologies (Table 2). However, the Applicant has excluded areas of the highest observed use by American white pelican from the Project Lease Boundary, which reduces the turbine collision exposure for this species. Based on the observed similarities in exposure indices across all turbine technologies, it is expected that the option requiring more turbines (Option 1) would result in greater collision risk for American white pelicans.

- Sandhill crane *(Grus canadensis)*: The exposure index for sandhill cranes for Option 1 technologies is approximately eight times less than Option 2 technologies (Table 2). Sandhill cranes have the highest mean use of the special status bird species observed during AUS. However, sandhill cranes may not be particularly susceptible to collision risk with turbines. Studies at wind facilities in other parts of the United States have shown that sandhill cranes are likely to avoid turbines despite relatively high numbers of sandhill cranes observed within and surrounding wind facilities (Nagy et al. 2012; Pearse et al. 2016).

- Ferruginous hawk: The exposure index for ferruginous hawks is approximately 1.3 times greater for the GE 3.03-MW turbine (Option 1) than for the other three turbine technologies (Table 2). AUS indicated very low mean use of the Project area by ferruginous hawks; however, breeding has been observed within 2 miles of the Lease Boundary. Because Option 1 also requires a larger number of turbines, it is expected that this option would result in greater collision risk for ferruginous hawks.

- Bald eagle *(Haliaeetus leucocephalus)*: The exposure index for bald eagles is approximately 1.1 to 1.3 times greater for Option 2 technologies than Option 1 technologies (Table 2). It is uncertain if the smaller exposure indices for Option 1 technologies would offset the larger number of turbines required.

- Golden eagle: The exposure index for golden eagles for Option 1 technologies is approximately 1.2 times greater than the GE 5.5-MW turbine (Option 2), but the same as for the SG 6.0-MW turbine (Option 2) (Table 2). Because Option 1 would also require a greater number of turbines than Option 2, it is expected to result in greater collision risk for golden eagles.
- Great blue heron *(Ardea herodias)*: Exposure indices are less than 0.001 for all turbine technologies (Table 2); therefore, the option requiring more turbines (Option 1) is expected to result in greater collision risk for great blue herons.
- Prairie falcon *(Falco mexicanus)*: Exposure indices for prairie falcons are 1.2 to 3.3 times greater for Option 1 technologies than Option 2 technologies (Table 2). Because Option 1 would also require a greater number of turbines than Option 2, it is expected to result in greater collision risk for prairie falcons.
- Tundra swan *(Cygnus columbianus)*: Exposure indices for tundra swans are 0.011 for the GE 3.03-MW turbine (Option 1) and zero at all other turbine technologies (Table 2). Because Option 1 would also require a greater number of turbines than Option 2, it is expected to result in greater collision risk for tundra swans.

Of the eight special status bird species for which exposure indices are available, exposure indices are highest for Option 1 technologies for four species (ferruginous hawk, golden eagle, prairie falcon, and tundra swan) and similar across all technologies for two species (American white pelican and great blue heron). Option 1 is expected to result in greater collision risk for these six special status species based on the combination of higher exposure indices and greater number of turbines than Option 2. Exposure indices are highest for Option 2 technologies for two special status bird species (sandhill crane and bald eagle), but it is uncertain to what degree this may be offset by fewer turbines. When interpreting these conclusions, it should be noted that exposure indices do not consider species-specific collision avoidance behavior around wind turbines.

Table 2: Exposure Indices for Special Status Bird Species

Common Name	Overall Mean Use[1]	Exposure Index			
		Option 1 (GE 2.82 MW Turbine)	Option 1 (GE 3.03 MW Turbine)	Option 2 (GE 5.5 MW Turbine)	Option 2 (SG 6.0 MW Turbine)
American white pelican	0.35	0.289	0.290	0.303	0.303
Sandhill crane	1.60	0.042	0.042	0.332	0.332
Bald eagle	0.02	0.009	0.011	0.012	0.012
Tundra swan	0.01	0	0.011	0	0
Prairie falcon	0.02	0.007	0.010	0.003	0.006
Golden eagle	0.01	0.007	0.007	0.006	0.007
Ferruginous hawk	0.01	0.003	0.004	0.003	0.003
Great blue heron	<0.01	<0.001	<0.001	<0.001	<0.001

[1] Overall mean use is the average number of observed individuals per survey plot.

GE = General Electric; MW = megawatts; SG = Siemens Gamesa

3.1.2 Literature Review

The effect of turbine height and rotor swept area on bird collision mortalities remains uncertain (AWWI 2021). It is possible that local factors at wind farms (e.g., bird abundance, species composition, topography, habitat, spatial arrangement of turbines) can lead to strong variation in bird mortality rates that confound possible effects of turbine size (Marques et al. 2014; Everaert 2014). Turbine size has been suggested as an important factor for collision risk because higher turbines may extend into the airspace traveled by migrating birds and higher turbines typically have a larger rotor swept zone and consequently a larger collision risk area. However, the relationship between turbine heights and bird mortality rates is not consistent among studies.

Some studies report higher bird mortality rates per turbine at taller turbines. Bird collision mortality modeled by Loss et al. (2013) predicted that mortality rates would increase nearly tenfold from 0.64 to 6.20 birds per turbine across the range of turbine heights included in their study, which was 118 to 262 feet (36 to 80 m). De Lucas et al. (2008) found a positive relationship between turbine height and mortality rate of raptors (i.e., more fatalities at taller turbines) at two wind farms in Spain where turbine heights ranged from 59 to 118 feet (18 to 36 m). A similar positive relationship was observed at Altamont Pass, California, where the number of bird mortalities at turbines with larger rotor diameters and rotors 79 feet (24 m) above ground was more than expected based on the number of turbines alone (Thelander et al. 2003). Thaxter et al. (2017) noted that bird mortality rates increased with larger turbine capacity (megawatts).

Other studies did not find a relationship between bird mortality rates and turbine height. Bird mortality rate and collision risk were not significantly related to turbine size at eight wind farms in Belgium, where turbine characteristics ranged from 75 to 322 feet (23 to 98 m) hub height and 112 to 456 feet (34 to 139 m) maximum total height (i.e., blade tip) (Everaert 2014). Barclay et al. (2007) compiled wind turbine and bird and bat mortality data from 33 wind farms in North America to assess the influence of turbine characteristics on collision risk. Turbine characteristics varied among sites, with rotor diameters ranging from 59 to 295 feet (18 to 90 m) and turbine hub heights ranging from 78 to 308 feet (24 to 94 m). They found that turbine height and rotor diameter did not influence bird mortality rate. The authors suggested that because a significant proportion of bird mortalities at wind farms occur during the day, the ability of birds to detect and avoid turbines may not vary with turbine size (Barclay et al. 2007). Krijgsveld et al. (2009) found that bird collision risk with larger multi-MW turbines (hub height 220 to 256 feet [67 to 78 m]; rotor diameter 217 feet [66 m]) was similar to earlier generation turbines and suggested that the increased altitude of turbine blades may allow more local birds (i.e., birds not undertaking migratory flight) to pass underneath the rotor area, while greater spacing between larger turbines may allow birds to pass between turbines. Further, mortality rates could also be related to rotation speed of the rotors (Krigjsveld et al. 2009). Large rotors rotate at lower speeds than small ones, which reduces the probability that birds flying through the rotor swept area will be hit (Orfloff and Flannery 1996). Tucker (1996) demonstrated mathematically that collision risk is higher closer to the hub than at the rotor tip and does not increase linearly with the surface area of the rotor swept zone.

Bird mortality rates may be lower at taller turbines per unit of energy generation, however results are not unequivocal. Although Thaxter et al. (2017) noted a strong positive relationship between wind turbine capacity (i.e., MW) and bird collision rate per turbine, the strength of this relationship was offset by the reduced number of turbines required per unit of energy generation. A greater number of small turbines resulted in higher predicted bird mortality rates than a smaller number of large turbines per unit energy output (Thaxter et al. 2017). Thaxter et al. (2017) concluded that wind farm generation capacity should be met by deploying fewer large turbines, rather than many smaller ones. However, they modeled turbines with a capacity range of 0.1 to 2.5 MW, which is lower than those considered for the Horse Heaven Wind Farm, and the number of estimated bird mortalities decreased exponentially up to 1.2 MW, but only slightly thereafter to 2.5 MW (Thaxter et al. 2017). Further, such results are not unequivocal. Huso et al. (2021) found that bird mortality rate was constant per unit of energy produced, a metric that accounts for turbine operating time, across all sizes and spacing of turbines at a repowered wind farm in California.

Replacing several small turbines with fewer larger turbines (i.e., repowering) has been hypothesized to reduce bird collision risk, particularly for raptors (Arnett and May 2016; Dahl et al. 2015; Thaxter et al. 2017). For example, repowering of the 20.5 MW Diablo Winds Energy Project in California from 105 150-kilowatt (kW) and 25 250-kW turbines to 38 of the larger 660-kW turbines decreased raptor mortalities per MW per year by 54% (Smallwood et al. 2009). When a wind farm in Sweden was repowered from 58 to 28 turbines that produced four times the amount of energy, the number of bird mortalities per turbine per year was 1.77 times greater, but this was offset by the reduced number of turbines and the total bird mortalities decreased by 19%, while the bird mortality rate per MW decreased by 80% (Hjernquist 2014 as cited in Dahl et al. 2015). Dahl et al. (2015) predicted a reduction in collision risk of 29% and 68% for white-tailed eagles at a wind farm in Norway if 68 2-MW turbines were repowered to 50 3-MW or 30 5-MW turbines, respectively. The reduced risk was attributed to fewer turbines and better individual siting (Dahl et al. 2015).

In summary, there is conflicting research regarding whether turbine size influences bird mortality rates, but the weight of evidence suggests that per unit of energy output, a wind farm layout with fewer larger turbines (i.e., Option 2) may have fewer total bird mortalities than one with a greater number of smaller turbines (i.e., Option 1). Some studies report no significant relationship between bird mortality rates and turbine size (Everaert 2014; Barclay et al. 2007; Krijsveld et al. 2009), while others report higher mortality rates with larger turbines (Loss et al. 2013; Dahl et al. 2015; De Lucas et al. 2008; Thelander et al. 2003; Thaxter et al. 2017). Even with a positive relationship between turbine size and mortality rates, it appears that the increased number of mortalities per turbine may be offset by fewer mortalities as a result of fewer turbines (e.g., Thaxter et al. 2017; Hjernquist 2014 as cited in Dahl et al. 2015).

There are several important limitations and sources of uncertainty related to this conclusion. Existing available information is derived from studies at wind farms with shorter turbines than those considered for the Project under either option. Notably, none of the studies reviewed during this literature review included turbines as tall as those considered under Option 2 (i.e., 410 feet [125 m] hub height). It is possible that a different relationship between turbine height and bird mortality rate may exist at turbine heights beyond the range considered in published literature. Additionally, relatively few studies have been completed at repowered wind farms; those that have been completed examined changes in bird mortality rates from replacing smaller old-generation turbines with fewer, larger, newer turbines (e.g., Smallwood et al. 2010). It is uncertain if similar differences in bird mortality rates would exist between two wind farm layouts with substantially larger turbines such as those considered under the two options for the Project. Finally, measuring impacts of repowering can be confounded by variability in space, time, and operational constraints (Huso et al. 2021), making it difficult to extrapolate results from one wind farm to another.

3.2 Bats

3.2.1 Acoustic Bat Surveys

The average number of bat passes per night recorded during acoustic bat surveys ranged from 0.27 to 1.12 among the study areas and survey years for which bat surveys were conducted for the Project (Table 3). Eight bat species were documented during acoustic bat surveys in and around the Lease Boundary (Table 3). No federal or state-listed bat species were detected. Most recorded bat passes were produced by three low-frequency bat species: silver-haired bat *(Lasionycteris noctivagans)*, hoary bat *(Lasiurus cinereus)*, and big brown bat *(Eptesicus fuscus)* (Table 4). The documented period of peak bat activity in and around the Lease Boundary occurred during September at all stations.

Table 3: Summary of Acoustic Bat Survey Results

Survey Year / Type	Horse Heaven West 2017	Horse Heaven West 2018	Horse Heaven West 2018[a]	Horse Heaven East 2018[b]
Survey Dates	19 Aug–30 Oct	14 May–29 Oct	14 May–29 Oct	11 May–29 Oct
No. of Stations	1	1	1	2
No. of Detectors	1	2	2	4
Detector Nights	72	303	344	670
Total Bat Passes	24	82	384	734
Number of High-Frequency (>30 kHz) Bat Passes	2	1	24	55
Number of Low-Frequency (<30 kHz) Bat Passes	22	81	360	679
Average Number of Bat Passes per Night	0.33 ± 0.08	0.27 ± 0.05	1.12 ± 0.13	1.09 ± 0.11

[a] Formerly Badger Canyon Wind Project

[b] Formerly Four Mile Wind Project

Source: Table 3.4-6 of the Application for Site Certification (Horse Heaven Wind Farm, LLC 2021)

Table 4: Bat Species Present by Study Phase

Common Name	Scientific Name	Number of Nights Present (Percentage of Nights Present)		
		Horse Heaven West 2017 & 2018	Horse Heaven West 2018[a]	Horse Heaven East 2018[b]
High-Frequency Group (>30 kHz)				
California bat	*Myotis californicus*	0 (0%)	0 (0%)	1 (<1%)
Canyon bat	*Parastrellus hesperus*	3 (<1%)	9 (3%)	11 (2%)
Little brown bat	*Myotis lucifugus*	0 (0%)	2 (1%)	8 (1%)
Long-legged bat	*Myotis volans*	0 (0%)	0 (0%)	2 (<1%)
Western long-eared bat	*Myotis evotis*	0 (0%)	0 (0%)	1 (<1%)

Common Name	Scientific Name	Number of Nights Present (Percentage of Nights Present)		
		Horse Heaven West 2017 & 2018	Horse Heaven West 2018[a]	Horse Heaven East 2018[b]
Low-Frequency Group (<30 kHz)				
Big brown bat	*Eptesicus fuscus*	8 (2%)	19 (6%)	31 (5%)
Hoary bat	*Lasiurus cinereus*	13 (3%)	47 (14%)	91 (14%)
Silver-haired bat	*Lasionycteris noctivagans*	55 (15%)	81 (24%)	169 (25%)
Total Number of Detector Nights		**375**	**344**	**670**

[a] Formerly Badger Canyon Wind Project

[b] Formerly Four Mile Wind Project

Source: Table 3.4-7 of the Application for Site Certification (Horse Heaven Wind Farm, LLC 2021)

kHz = kilohertz

3.2.2 Literature Review

Collision with turbines is considered one of the greatest threats to bats in North America (O'Shea et al. 2016). Post-construction monitoring studies at wind farms show that migratory tree-roosting bat species (e.g., eastern red bat *[Lasiurus borealis]*, hoary bat, and silver-haired bat) compose approximately 72% of reported bat fatalities and occur mostly during fall migration (August to September) (AWWI 2018). Based on data from 52 wind farms in Washington, hoary and silver-haired bats made up 52% and 44% of reported bat mortalities (WEST 2019). In Washington, mortality estimates from 13 wind farms had a median adjusted mortality rate of 1.4 bats/MW/year (range 0.4 to 2.5 bats per MW per year) (WEST 2019). The bat fatality rate at the nearby Nine Canyon Wind Project was 2.47 bats per MW per year and consisted entirely of hoary and silver-haired bats (Horse Heaven Wind Farm, LLC 2021). The ASC predicted that bat mortalities during operation of the Project (Horse Heaven Wind Farm, LLC 2021) would:

- be within the range of other facilities in Washington
- consist primarily of migratory, tree-roosting species (e.g., silver-haired bat, hoary bat)
- occur mainly in the fall

Considering that only three species make up most bat mortalities resulting from turbine collision, population-level impacts to these species may become an issue as the number of wind farms increases (Barclay et al. 2007; Zimmerling and Francis 2016; Hein and Schirmacher 2016). Demographic modeling suggests that mortality from wind turbines may drastically reduce population size of the hoary bat and increase its risk of extinction (Frick et al. 2017). The qualitative conclusions are likely broadly informative about the relative risk to other migratory bat species that share similar life histories and high fatality rates at wind turbines, such as silver-haired bat (Frick et al. 2017). The potential for population-level consequences for some bat species from wind farm development across North America highlights the importance of considering them as priority species for mitigation measures. However, the effect of turbine height and rotor swept area on bat collision mortalities remains uncertain (AWWI 2021).

Some studies report that bat mortality rates increase with turbine size (Baerwald and Barclay 2009), including on a per MW basis (Barclay et al. 2007). A study conducted at nine wind farms in southern Alberta, where turbine heights ranged from 164 to 276 feet (50 to 84 m), found that bat mortality rates increase with turbine height (Baerwald and Barclay 2009). That study also found that the interaction between migratory bat activity at 98 feet (30 m) above ground level and turbine height was an important predictor of bat mortality rates (Baerwald and Barclay 2009). Modeling predicted that sites with high activity but relatively short turbines had low mortality rates, as did sites with low activity but tall turbines. At sites with little migratory bat activity, mortality rates were predicted to be low regardless of turbine height. However, at sites with high bat activity, an increase in turbine height also increases the mortality rate (Baerwald and Barclay 2009). Barclay et al. (2007) compiled wind turbine and bat mortality data from 33 wind farms in North America to assess the influence of turbine characteristics on collision risk. Turbine characteristics varied across sites, with rotor diameters ranging from 59 to 295 feet (18 to 90 m) and turbine hub height ranging from 78 to 308 feet (24 to 94 m). They found that rotor diameter did not influence bat mortality rate, but turbine (i.e., hub) height did. Fatality rates of bats were relatively low at short turbines (< 213 feet [65 m] high) but increased exponentially with turbine height. The highest bat fatality rates occurred at turbines with towers 213 feet (65 m) or taller and increased with MW capacity per turbine (Barclay et al. 2007). Barclay et al. (2007) concluded that replacing several small turbines (each with low power output) with one large one (with higher power output) may help reduce bird fatalities but is likely to increase the number of bats killed per megawatt of installed capacity. They also suggested that taller turbines reach the airspace used by migrating bats and that minimizing turbine height may help minimize bat fatalities (Barclay et al. 2007). Radar studies indicate that nocturnal migrants fly at heights ranging from <328 feet (100 m) to >0.61 miles (1 kilometer) (Barclay et al. 2007), noting that radar cannot distinguish between bats and birds.

Some studies report lower bat mortality rates at taller turbines on a per MW basis (Fielder et al. 2007) or suggest that bat mortality rates increase on either side of an optimum intermediate turbine size (Thaxter et al. 2017). Although bat mortality estimates at a wind farm in Tennessee were greater on a per turbine basis at larger 1.8-MW turbines (V80 turbine with a height of 256 feet [78 m] and rotor diameter of 276 feet [84 m]) than at smaller 0.66-MW turbines (V47 turbine with a height of 213 feet [65 m] and rotor diameter of 151 feet [46 m]), when mortality was measured per MW, the smaller V47 turbines had a greater mortality rate (53.3 bats/MW/year) than the larger V80 turbines (38.7 bats per MW per year) (Fiedler et al. 2007). Thaxter et al. (2017) suggest that for bats, an optimum turbine size of approximately 1.25 MW may minimize collision risk. Their models indicated that per unit of energy output at a hypothetical 10-MW wind farm, using one thousand 0.01-MW turbines resulted in the largest estimated number of bat mortalities. Thereafter, the numbers decreased exponentially up to approximately 1.2 MW, but then increased again from 14 bats with 1.2-MW turbines, to 24 bats with 2.5-MW turbines. However, the authors cautioned that model certainty was low and more research was required to understand the relationship between collision risk and turbine size for larger turbines (Thaxter et al. 2017).

Overall, the relationship between turbine height and bat collision mortalities is too inconclusive to make confident predictions regarding which turbine option is expected to result in fewer bat mortalities. There is limited and conflicting information about the effect of turbine height on bat collision mortalities. Some studies report that bat mortality rates increase with turbine size (Baerwald and Barclay 2009), including on a per MW basis (Barclay et al. 2007), while others report no effect (Huso et al. 2021), the opposite effect (Fielder et al. 2007), or that mortality rates increase on either side of an optimum intermediate turbine size (Thaxter et al. 2017). Extrapolating results from these studies to the Horse Heaven Wind Farm is further limited by the range of turbine heights analyzed, which are shorter than those under consideration for the Project under either option. It is possible that a different relationship between turbine height and bat mortality rate may exist at turbine heights beyond the range considered in available published literature.

4.0 CONCLUSION

This special study report contains supplemental information regarding potential bird and bat collision risk between the two turbine options considered for the Project for use in the Energy Facility Site Evaluation Council's evaluation of impacts within the Environmental Impact Statement. The following provides a summary of anticipated wildlife collision risk associated with the two turbine options based on information collected during baseline studies and a review of available published scientific literature:

- Based on AUS data:
  - Mean exposure indices for small bird species were highest at the GE 3.03-MW turbines (Option 1) and similar across the three other turbine technologies. Therefore, Option 1 is expected to result in a greater number of small bird mortalities.
  - Among large bird species, exposure indices for raptors were higher for shorter turbines (Option 1), but exposure indices for waterfowl were higher at taller turbines (Option 2). It is expected that the option requiring a greater number of shorter turbines (Option 1) would result in more large bird mortalities because raptors appear more susceptible to turbine collisions than waterfowl (AWWI 2021).
  - Option 1 is expected to result in greater collision risk for six of the eight special status bird species observed during AUS (ferruginous hawk, golden eagle, prairie falcon, tundra swan, American white pelican, great blue heron). Exposure indices were highest for Option 2 technologies for two special status bird species (sandhill crane, bald eagle), but it is uncertain to what degree this may be offset by fewer turbines.
- Based on a literature review, the weight of evidence suggests that per unit of energy output, a wind farm layout with fewer larger turbines (i.e., Option 2) is likely to have fewer total bird mortalities than one with a greater number of smaller turbines (i.e., Option 1).
- The relationship between turbine height and bat collision mortalities is too inconclusive to make confident predictions regarding which turbine option is expected to result in fewer bat mortalities.

The mortality risk for different taxa should be weighed against the potential for population-level impacts. For example, collisions with turbines do not appear likely to lead to population-level impacts for small passerine (i.e., songbird) species (AWWI 2021), but may have population-level impacts for some diurnal raptor species based on future wind energy projections (Diffendorfer et al. 2021). Considering that only three bat species (hoary, silver-haired, and eastern red bat) make up most bat mortalities at turbines, population-level impacts may become an issue as the number of wind farms increase (Barclay et al. 2007; Hein and Schirmacher 2016; Zimmerling and Francis 2016; Frick et al. 2017).

It is important to acknowledge that there is uncertainty associated with these conclusions related to conflicting results in available published scientific studies, lack of studies at turbines within the range of heights considered for the Horse Heaven Wind Farm, and potential for substantial variability in wildlife mortality based on local factors (e.g., bird abundance, species composition, topography, habitat, spatial arrangement of turbines). These sources of uncertainty limit the confidence of predicted wildlife mortality risk associated with the two turbine options.

5.0 CLOSURE

We trust that the information contained in this report is sufficient for your present needs. Should you have any questions regarding the Project or this report, please do not hesitate to contact the undersigned.

The material in this report reflects Golder's best judgment based on information available at the time of preparation and has been produced in a manner consistent with the level of care and skill normally exercised by environmental professionals currently practicing under similar conditions in the jurisdiction in which the services are provided. If the report is edited, revised, altered, or added to in any way, all references to Golder and Golder's employees must be removed unless changes are agreed to by Golder. Any use which a third party makes of this report or any reliance on or decisions to be made based on it are the responsibility of such third party. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decision made or action based on this report.

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APPENDIX A

Species-specific Exposure Indices from Avian Use Studies

Table A-1: Exposure Indices Calculated for Small Bird Species Observed During Avian Use Studies, 2017-2020

Common Name	Overall Mean Use	Percentage Flying	Option 1				Option 2			
			GE 2.82 MW Turbine (25 to 155 m RSH)		GE 3.03 MW Turbine (10 to 155 m RSH)		GE 5.5 MW Turbine (45 to 205 m RSH)		SG 6.0 MW Turbine (30 to 200 m RSH)	
			Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index
Horned lark	5.30	69.0	8.5	0.312	34.9	1.275	0	0	5.1	0.187
Unidentified small bird	0.15	96.1	21.6	0.032	95.9	0.149	21.6	0.032	21.6	0.032
Bank swallow	0.14	100.0	0	0	50.0	0.072	0	0	0	0
White-crowned sparrow	0.14	70.0	0	0	62.5	0.063	0	0	0	0
European starling	0.10	69.6	79.8	0.057	81.9	0.059	2.1	0.002	78.7	0.057
Barn swallow	0.09	100.0	10.3	0.010	41.4	0.039	0	0	10.3	0.010
Brewer’s blackbird	0.03	100.0	0	0	50.0	0.014	0	0	0	0
Western meadowlark	0.28	31.8	0	0	11.7	0.011	0	0	0	0
Western kingbird	0.03	31.3	20.0	0.002	80.0	0.008	0	0	20.0	0.002
Unidentified swallow	0.02	100.0	0	0	28.6	0.007	0	0	0	0
Savannah sparrow	0.06	76.9	0	0	12.0	0.006	0	0	0	0
Cliff swallow	0.04	100.0	0	0	10.0	0.004	0	0	0	0
American goldfinch	0.02	14.9	71.4	0.002	71.4	0.002	0	0	0	0
Red-winged blackbird	<0.01	100.0	66.7	0.001	100.0	0.002	0	0	66.7	0.001

Common Name	Overall Mean Use	Percentage Flying	Option 1				Option 2			
			GE 2.82 MW Turbine (25 to 155 m RSH)		GE 3.03 MW Turbine (10 to 155 m RSH)		GE 5.5 MW Turbine (45 to 205 m RSH)		SG 6.0 MW Turbine (30 to 200 m RSH)	
			Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index
American pipit	<0.01	50.0	50.0	0.001	50.0	0.001	0	0	0	0
Vesper sparrow	<0.01	85.7	16.7	0.001	16.7	0.001	0	0	0	0
American robin	<0.01	100.0	0	0	0	0	0	0	0	0
Chipping sparrow	<0.01	50.0	0	0	0	0	0	0	0	0
Golden-crowned sparrow	<0.01	100.0	0	0	0	0	0	0	0	0
Grasshopper sparrow	0.02	16.7	0	0	0	0	0	0	0	0
House finch	0.01	100.0	0	0	0	0	0	0	0	0
Lark sparrow	0.01	50.0	0	0	0	0	0	0	0	0
Northern flicker	0.01	25.0	0	0	0	0	0	0	0	0
Say’s phoebe	<0.01	100.0	0	0	0	0	0	0	0	0
Song sparrow	0.01	100.0	0	0	0	0	0	0	0	0
Unidentified passerine	<0.01	100.0	0	0	0	0	0	0	0	0
Unidentified sparrow	<0.01	50.0	0	0	0	0	0	0	0	0

Source: Table 3.4-9 of the ASC (Horse Heaven Wind Farm, LLC 2021).

MW = megawatt; RSH = rotor swept height

Table A-2: Exposure Indices Calculated for Large Bird Species Observed during Avian Use Studies, 2017–2020

Common Name	Overall Mean Use	Percentage Flying	Option 1				Option 2			
			GE 2.82 MW Turbine (25 to 155 m RSH)		GE 3.03 MW Turbine (10 to 155 m RSH)		GE 5.5 MW Turbine (45 to 205 m RSH)		SG 6.0 MW Turbine (30 to 200 m RSH)	
			Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percent Flying within RSH	Exposure Index
Corvids										
American crow	<0.01	100.0	0	0	0	0	0	0	0	0
Black-billed magpie	0.02	93.3	10.7	0.002	21.4	0.004	0	0	10.7	0.002
Common raven	1.54	93.8	53.2	0.77	82.2	1.19	25.1	0.363	47.2	0.684
Diurnal Raptors										
American kestrel	0.18	52.6	22.1	0.021	72.6	0.07	4.4	0.004	15.0	0.014
Bald eagle	**0.02**	**100.0**	**60.0**	**0.009**	**73.3**	**0.011**	**80.0**	**0.012**	**80.0**	**0.012**
Cooper's hawk	0.01	100.0	66.7	0.007	66.7	0.007	33.3	0.003	66.7	0.007
Ferruginous hawk	**0.01**	**100.0**	**50.0**	**0.003**	**75.0**	**0.004**	**50.0**	**0.003**	**50.0**	**0.003**
Golden eagle	**0.01**	**85.7**	**100.0**	**0.007**	**100.0**	**0.007**	**83.3**	**0.006**	**100.0**	**0.007**
Merlin	<0.01	100.0	0	0	0	0	0	0	0	0
Northern harrier	0.56	98.4	10.6	0.058	24.7	0.136	5.9	0.032	8.9	0.049
Osprey	<0.01	100.0	100.0	0.002	100.0	0.002	100.0	0.002	100.0	0.002
Prairie falcon	**0.02**	**57.6**	**63.2**	**0.007**	**89.5**	**0.01**	**26.3**	**0.003**	**52.6**	**0.006**
Red-tailed hawk	0.32	78.7	75.7	0.188	91.7	0.228	60.3	0.15	72.6	0.181

Common Name	Overall Mean Use	Percentage Flying	Option 1				Option 2			
			GE 2.82 MW Turbine (25 to 155 m RSH)		GE 3.03 MW Turbine (10 to 155 m RSH)		GE 5.5 MW Turbine (45 to 205 m RSH)		SG 6.0 MW Turbine (30 to 200 m RSH)	
			Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percent Flying within RSH	Exposure Index
Rough-legged hawk	0.26	88.7	75.9	0.172	93.8	0.213	49.5	0.112	71.0	0.161
Sharp-shinned hawk	0.01	100.0	42.9	0.002	71.4	0.004	28.6	0.002	42.9	0.002
Swainson's hawk	0.24	83.4	83.7	0.164	97.2	0.19	62.6	0.123	79.3	0.155
Unidentified accipiter	<0.01	100.0	75.0	0.003	75.0	0.003	75.0	0.003	100.0	0.003
Unidentified buteo	0.03	75.0	70.0	0.013	70.0	0.013	63.3	0.012	73.3	0.014
Unidentified falcon	0.01	70.0	28.6	0.001	42.9	0.002	14.3	0.001	14.3	0.001
Unidentified raptor	0.02	100.0	54.5	0.009	90.9	0.015	36.4	0.006	63.3	0.011
Doves/Pigeons										
Mourning dove	0.01	65.4	0	0	52.9	0.005	0	0	0	0
Rock pigeon	1.01	80.2	47.8	0.388	78.2	0.634	8.8	0.071	37.5	0.304
Gulls/Terns										
California gull	0.23	100.0	70.2	0.159	91.1	0.206	28.6	0.065	78.0	0.176
Ring-billed gull	0.02	100.0	30.8	0.005	30.8	0.005	3.8	0.001	28.8	0.005
Unidentified gull	0.09	100.0	94.2	0.087	97.1	0.09	89.4	0.082	93.3	0.086

Common Name	Overall Mean Use	Percentage Flying	Option 1				Option 2			
			GE 2.82 MW Turbine (25 to 155 m RSH)		GE 3.03 MW Turbine (10 to 155 m RSH)		GE 5.5 MW Turbine (45 to 205 m RSH)		SG 6.0 MW Turbine (30 to 200 m RSH)	
			Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percent Flying within RSH	Exposure Index
Owls										
Short-eared owl	<0.01	66.7	0	0	0	0	0	0	0	0
Shorebirds										
Killdeer	0.01	96.0	16.7	0.001	83.3	0.007	0	0	0	0
Long-billed curlew	0.01	60.0	16.7	0.001	100.0	0.003	0	0	16.7	0.001
Upland Game Birds										
California quail	0.01	13.3	0	0	0	0	0	0	0	0
Gray partridge	0.01	11.1	0	0	0	0	0	0	0	0
Vultures										
Turkey vulture	0.01	100.0	100.0	0.008	100.0	0.008	100.0	0.008	100.0	0.008
Waterbirds										
American white pelican	**0.35**	**100.0**	**81.5**	**0.289**	**81.9**	**0.29**	**85.6**	**0.303**	**85.6**	**0.303**
Great blue heron	**<0.01**	**100.0**	**100.0**	**<0.001**	**100.0**	**<0.001**	**100.0**	**<0.001**	**100.0**	**<0.001**
Sandhill crane	**1.60**	**98.4**	**2.6**	**0.042**	**2.6**	**0.042**	**21.1**	**0.332**	**21.1**	**0.332**

Common Name	Overall Mean Use	Percentage Flying	Option 1				Option 2			
			GE 2.82 MW Turbine (25 to 155 m RSH)		GE 3.03 MW Turbine (10 to 155 m RSH)		GE 5.5 MW Turbine (45 to 205 m RSH)		SG 6.0 MW Turbine (30 to 200 m RSH)	
			Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percentage Flying within RSH	Exposure Index	Percent Flying within RSH	Exposure Index
Waterfowl										
Canada goose	1.87	78.5	85.3	1.25	85.6	1.254	94.9	1.39	97.5	1.428
Greater white-fronted goose	0.01	100.0	100.0	0.011	100.0	0.011	57.1	0.006	100.0	0.011
Snow goose	12.96	98.0	75.5	9.579	76.3	9.681	81.7	10.372	98.3	12.479
Tundra swan	**0.01**	**100.0**	**0**	**0**	**100.0**	**0.011**	**0**	**0**	**0**	**0**
Unidentified goose	0.04	100.0	100.0	0.037	100.0	0.037	100.0	0.037	100.0	0.037

Source: Table 3.4-10 of the ASC (Horse Heaven Wind Farm 2021).

GE = General Electric; MW = megawatt; RSH = rotor swept height; SG = Siemens Gamesa

Bold text indicates special status bird species.

APPENDIX 4.10-1

Glare Analysis Inputs and Assumptions

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Glare Analysis Report for the Horse Heaven Wind Farm

Benton County, Washington

Prepared for:

SCOUT
CLEAN ENERGY

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TETRA TECH

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January 2021

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EXECUTIVE SUMMARY

At the request of Scout Clean Energy, LLC (Scout), Tetra Tech, Inc. (Tetra Tech) conducted a glint and glare analysis of the proposed Horse Heaven Wind Farm (Project), which includes proposed solar energy generation in addition to wind. The analysis was conducted using the Solar Glare Hazard Analysis Tool (SGHAT) software through an online tool (GlareGauge) developed by Sandia National Laboratories and hosted by ForgeSolar. A total of eight glare analyses were conducted for the Project. The analyses modeled the points of view from an average first- and second-floor structure, as well as those from a typical commuter car and commercial truck. These analyses included several representative observation points from the surrounding community and several segmented traffic routes chosen to represent the relative traffic routes around the array areas.

The results of the analyses indicate that the surrounding observation points and vehicle routes would not experience glare as a result of the Project. The lack in predicted glare could be a result of the parameters for the solar panels and the relative lack of representative points from the surrounding area. The predicted glare at these receptors is considered to be a conservative representation as the SGHAT does not consider obstacles (either man-made or natural) between the defined solar photovoltaic arrays and the receptors such as vegetative screening (existing or planted), buildings, topography, etc. Where such features exist, they would screen views of the Project and, thus, minimize or eliminate glare from these receptor locations.

Based on the results of the Federal Aviation Administration Notice Criteria Tool, the Project does not exceed notice criteria and a formal filing is not necessary.

1 INTRODUCTION

The Horse Heaven Wind Farm (Project) consists of a renewable energy generation facility, which is located in unincorporated Benton County, Washington, within the Horse Heaven Hills area, which is an anticline ridge of the Yakima Folds within the larger Columbia Plateau Ecoregion. At its closest point, the Project is located approximately 4 miles south/southwest of the city of Kennewick and the larger Tri-Cities urban area, along the Columbia River. In addition to proposed wind energy generation, the Project would include solar energy generation. Currently, Scout Clean Energy (Scout) is considering multiple areas for solar photovoltaic (PV) arrays for siting during final design (Attachment A). This analysis includes each potential set of solar arrays, divided into three areas for the purposes analysis: Solar Array County Well (West 1) near County Well Road, Solar Array Sellards (West 2) near Sellards Road, and Solar Array East on either side of Interstate-82 (Attachment B, Figure 1).

As an industry standard, the term "glint and glare" analysis is typically used to describe an analysis of potential ocular impacts to defined receptors. ForgeSolar defines glint and glare in the following statement:

> *Glint is typically defined as a momentary flash of bright light, often caused by a reflection off a moving source. A typical example of glint is a momentary solar reflection from a moving car. Glare is defined as a continuous source of bright light. Glare is generally associated with stationary objects, which, due to the slow relative movement of the sun, reflect sunlight for a longer duration.*

Based on the ForgeSolar definitions of glint and glare and the stationary nature of the Project solar PV modules related to the sun, the potential reflectance from the Project modeled throughout this report will be referred to as glare.

Tetra Tech completed a glare analysis using the Solar Glare Hazard Analysis Tool (SGHAT) software, developed by Sandia Laboratories, now hosted by ForgeSolar (as discussed further below; ForgeSolar 2020). The SGHAT software is considered an industry best practice and conservative model that effectively models the potential for glare at defined receptors from defined solar energy generating facilities. As discussed further below, the model is conservative in that it does not account for potential screening such as existing or proposed vegetation, topography outside of the defined areas, buildings, walls, or fences.

This report summarizes the glare analysis conducted based on the preliminary Project layout provided by Scout in November of 2020. Included as attachments are the Preliminary Project Layout that formed the basis of the analysis (Attachment A); Figure 1, "Solar Array Areas" and Figures 2a through 2c, "Glare Receptors" (Attachment B); and the raw glare analysis output reports generated through the use of the ForgeSolar tool (Attachment C).

2 FEDERAL AVIATION ADMINISTRATION NOTICE CRITERIA CONSULTATION

The Federal Aviation Administration (FAA) developed *Technical Guidance for Evaluating Selected Solar Technologies on Airports* in 2010, in addition to FAA regulatory guidance under 78 *Federal Register* (FR) 63276 Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports (collectively referred to as FAA Guidance) (FAA 2010). The FAA Guidance recommends that glare analyses should be performed on a site-specific basis using the Sandia Laboratories SGHAT (FAA 2010). This guidance applies to solar facilities located on federally-obligated airport property; it is not mandatory for a proposed solar installation that is not on an airport (and for which a Form 7460-1 is filed with FAA pursuant to Title 14 Code of Federal Regulations [CFR] Part 77.9, as discussed below), but is considered to be an industry best practice for solar facilities in general. The SGHAT is the standard for measuring potential ocular impact as a result of solar facilities (78 FR 63276).

According to 78 FR 63276, the FAA has determined that "glint and glare from solar energy systems could result in an ocular impact to pilots and/or air traffic control facilities and compromise the safety of the air transportation system." The FAA has developed the following criteria for analysis of solar energy projects located on jurisdictional airports:

- No potential for glint or glare in the existing or planned air traffic control tower cab; and
- No potential for glare or "low potential for after-image" along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as 2 miles from 50 feet above the landing threshold using a standard 3-degree glidepath.

The online FAA Notice Criteria Tool (NCT) reports whether a proposed structure is in proximity to a jurisdictional air navigation facility and if formal submission to the FAA under 14 CFR Part 77.9 (Safe, Efficient Use, and Preservation of the Navigable Airspace) is recommended (FAA 2020). The NCT also identifies final approach flight paths that may be considered vulnerable to a proposed structure's impact on navigation signal reception. The NCT was utilized to determine if the proposed Project is located within an FAA-identified impact area based on the Project boundaries and height above ground surface. The FAA NCT Report stated that the Project does not exceed notice criteria.

3 GLARE ANALYSIS METHOD

The SGHAT is considered to be an industry best practice for analysis of glare related to solar energy generating facilities. Tetra Tech utilized the SGHAT technology as part of an online tool (GlareGauge) developed by Sandia National Laboratories and hosted by ForgeSolar. GlareGauge provides a quantitative assessment of the following (ForgeSolar 2020):

- When and where glare has the potential to occur throughout the year for a defined solar array polygon; and
- Potential effects on the human eye at locations where glare is predicted.

The following statement was issued by Sandia Laboratories regarding the SGHAT technology:

> *Sandia developed SGHAT v. 3.0, a web-based tool and methodology to evaluate potential glint/glare associated with solar energy installations. The validated tool provides a quantified assessment of when and where glare will occur, as well as information about potential ocular impacts. The calculations and methods are based on analyses, test data, a database of different photovoltaic module surfaces (e.g. anti-reflective coating, texturing), and models developed over several years at Sandia. The results are presented in a simple easy-to-interpret plot that specifies when glare will occur throughout the year, with color indicating the potential ocular hazard.* (Sandia 2016)

Note, however, that technology changes continue to occur to address issues such as reflectivity. The model, therefore, presents a conservative assessment based upon simplifying assumptions inherent in the model as well as industry improvements since the most recent update of such assumptions.

Based on the predicted retinal irradiance (i.e., intensity) and subtended angle (i.e., size/distance) of the glare source to receptor, the GlareGauge categorizes potential glare where it is predicted by the model to occur in accordance with three tiers of severity (i.e., ocular hazards) that are shown by different colors in the model output:

- Red glare: glare predicted with a potential for permanent eye damage (i.e., retinal burn)
- Yellow glare: glare predicted with a potential for temporary after-image
- Green glare: glare predicted with a low potential for temporary after-image

These categories of glare are calculated using a typical observer's blink response time, ocular transmission coefficient (i.e., the amount of radiation absorbed in the eye prior to reaching the retina), pupil diameter, and eye focal length (i.e., the distance between where rays intersect in the eye and the retina). As a point of comparison, direct viewing of the sun without a filter is considered to be on the border between yellow glare and red glare, while typical camera flashes are considered to be lower tier yellow glare (i.e., approximately 3 orders of magnitude less than direct viewing of the sun). Upon exposure to yellow glare, the observer may experience a spot in their vision temporarily lasting after the exposure. Upon exposure to green glare, the observer may experience a bright reflection but typically no spot lasting after exposure.

4 GLARE ANALYSIS INPUTS

The modules to be used for the proposed Project are smooth glass surface material with an anti-reflection coating (ARC), which are parameters selected in the glare analyses. Values associated with panel reflectivity and reflective scatter were not altered from the GlareGauge standard input averaged from various module reflectance profiles produced from module research concluded in 2016; therefore, as previously noted, the model does not incorporate further advances in anti-reflective coatings since that time (Sandia 2016).

Due to capacity constraints in the SGHAT, which limits the number of drawn photovoltaic (PV) array areas to 20 per analysis, Tetra Tech performed eight separate glare analyses: two for Solar Array County Well (West 1) (Analysis 1 and 2), two for Solar Array Sellards (West 2) (Analysis 3 and 4), four for Solar Array East (Analyses 5 through 8). Each analysis evaluated separate "PV Array Areas," which are segmented polygons within each of the three larger solar array areas generally representative of the proposed Project layout as of November 2020 (Attachment A). Analysis 1 and 2 consisted of 12 PV Array Areas, Analysis 3 and 4 consisted of 18 PV Array Areas, Analysis 5 and 6 consisted of 17 PV Array Areas, and Analysis 7 and 8 consisted of 13 PV Array Areas (Attachment B). Segmentation of the Project layout allows GlareGauge to more accurately represent potential ocular impacts as a result of the Project.

Each analysis run included proximal segmented vehicular traffic routes, as well as several residential receptors (also referred to as observation points [OPs]). The vehicular route and residential receptors were selected to provide a representation of proximal areas surrounding the Project that could experience glare. The route segment extents were based on the results of Tetra Tech's preliminary viewshed analysis for the Project. The residential receptors are a subset of the noise sensitive receptors analyzed for the

Project as part of the acoustic assessment (see Section 4.1.1 and Appendix O in the Application for Site Certification), and retain the associated identification numbers for cross-reference in addition to the simplified OP numbering needed for the SGHAT. The analyses for each array area were run first from the point of view from an average first floor (6 feet) and typical commuter car height (5 feet), followed by an analysis from the point of view from an average second floor residential structure (16 feet) and commercial truck height above the road surface (9 feet). The additional input features used in the analyses are summarized in Table 1.

Table 1. Glare Analyses Input Features

Analysis No.	Racking Type	Module Orientation[1]	Tilt[2] (degrees)	Resting Angle (degrees)[3]	Module Height[4] (feet)	OP Height[5] (feet)	Route Height[6] (feet)
1	Single Axis Tracking	East-to-West-facing	Variable	10	8	6	5
2	Single Axis Tracking	East-to-West-facing	Variable	10	8	16	9
3	Single Axis Tracking	East-to-West-facing	Variable	10	8	6	5
4	Single Axis Tracking	East-to-West-facing	Variable	10	8	16	9
5	Single Axis Tracking	East-to-West-facing	Variable	10	8	6	5
6	Single Axis Tracking	East-to-West-facing	Variable	10	8	16	9
7	Single Axis Tracking	East-to-West-facing	Variable	10	8	6	5
8	Single Axis Tracking	East-to-West-facing	Variable	10	8	16	9

Notes:
OP = observation point; PV = photovoltaic
[1] PV Array Areas modeled as single axis tracking modules from east-facing in the morning hours to west-facing in the evening hours.
[2] The module tilt varies through the day as they track the sun, the maximum tracking angle tilt is ±50˚.
[3] The resting angle is used to model module backtracking when the sun is outside of the module rotation range. A resting angle of 10 assumes that the modules immediately revert back to 10˚ (backtrack) when the sun is outside of the rotation range.
[4] Average module centroid height above ground surface.
[5] Height of observation point receptor: 6 feet represents an average first floor residential/commercial point of view and 16 feet represents an average second floor residential/commercial point of view.
[6] Height of vehicular route receptor: 5 feet represents typical commuter car height views and 9 feet represents typical semi-tractor-trailer truck views.

5 GLARE ANALYSIS ASSUMPTIONS

The GlareGauge model is bound by conservative limitations. The following assumptions provide a level of conservatism to the GlareGauge model:

- The GlareGauge model simulates PV arrays as infinitesimally small modules within planar convex polygons exemplifying the tilt and orientation characteristics defined by the user. Gaps between modules, variable heights of the PV array within the polygons, and supporting structures are not considered in the analysis. Because the actual module rows will be separated by open space, this model assumption could result in indication of glare in locations where panels will not be located. In addition, the supporting structures are considered to have reflectivity values that are negligible relative to the module surfaces included in the model.
- The GlareGauge model utilizes a simplified model of backtracking, which assumes panels instantaneously revert to the "resting angle" whenever the sun is outside the rotation range.
- The GlareGauge model assumes that the observation point receptor can view the entire PV array segment when predicting glare minutes; however, it may be that the receptor at the observation point may only be able to view a small portion (typically the nearest edge) of the PV array segment. Therefore, the predicted glare minutes and intensity from a specific PV array to a specific observation point are conservative because the observer will likely not experience glare from the entire PV array segment at once.
- The GlareGauge model does not consider obstacles (either man-made or natural) between the defined PV arrays and the receptors such as vegetative screening (existing or planted), buildings, topography, etc. Where such features exist, they would screen views of the Project and, thus, minimize or eliminate glare from those locations.
- The GlareGauge model does not consider the potential effect of shading from existing topography between the sun and the Project outside of the defined areas.
- The direct normal irradiance (DNI) is defined as variable using a typical clear day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum of 1,000 watts per square meter (W/m^2) at solar noon. The irradiance profile uses the coordinates from Google Maps and a sun position algorithm to scale the DNI throughout the year. The actual daily DNI would be affected by precipitation, cloud cover, atmospheric attenuation (radiation intensity affected by gaseous constituents), and other environmental factors not considered in the GlareGauge model. This may result in modeled predicted glare occurrences when in fact the glare is not actually occurring due to cloud cover, rain, or other atmospheric conditions.

Note that hazard zone boundaries shown in the Glare Hazard plots are an approximation; actual ocular impacts encompass a continuous, not discrete, spectrum.

6 GLARE ANALYSIS RESULTS

Tetra Tech performed eight different analyses covering four groupings of PV arrays to provide a quantitative assessment of the potential for glare from the Project based on different receptor characteristics. The GlareGauge model's predicted results for the Project are summarized in the following sections partitioned according to the receptor parameters.

6.1 Analysis 1: Solar Array County Well (West 1) PV Array Areas - First Story and Commuter Car View Results

Analysis 1 consisted of 12 PV Arrays (1-1 through 1-12), as viewed from four OPs at 6 feet above ground surface (i.e., typical first story receptor height), and seven segmented vehicular traffic routes at 5 feet above ground surface (i.e., typical commuter vehicle receptor height) (Attachment B, Figure 2a).

Table 2 represents the glare summary in annual minutes of glare for Analysis 1. Based on the SGHAT results, no amounts of glare are predicted at any of the OPs or at the segmented vehicular routes.

Table 2. Analysis 1 Annual Minutes of Glare Summary – Solar Array County Well

Receptor ID	Green Glare	Yellow Glare	Red Glare
185 (OP-1)	0	0	0
737 (OP-2)	0	0	0
715 (OP-3)	0	0	0
743 (OP-4)	0	0	0
Country Well Rd	0	0	0
Sellards Road-1	0	0	0
Sellards Road-2	0	0	0
S Travis Road-1	0	0	0
WA-221-1	0	0	0
WA-221-2	0	0	0
WA-221-3	0	0	0

6.2 Analysis 2: Solar Array County Well (West 1) PV Array Areas - Second Story and Commercial Truck View Results

Analysis 2 included the same PV Arrays and the same receptor locations as Analysis 1, with the OP viewing height raised to 16 feet above ground surface (i.e., typical second story receptor height) and the segmented vehicular traffic route viewing height raised to 9 feet above ground surface (i.e., typical commercial truck receptor height) (Attachment B, Figure 2a).

Table 3 represents the glare summary in annual minutes of glare for Analysis 2. Based on the SGHAT results, no amounts of glare were predicted at any of the defined receptors.

Table 3. Analysis 2 Annual Minutes of Glare Summary – Solar Array County Well

Receptor ID	Green Glare	Yellow Glare	Red Glare
185 (OP-1)	0	0	0
737 (OP-2)	0	0	0
715 (OP-3)	0	0	0
743 (OP-4)	0	0	0
Country Well Rd	0	0	0
Sellards Road-1	0	0	0
Sellards Road-2	0	0	0
S Travis Road-1	0	0	0
WA-221-1	0	0	0
WA-221-2	0	0	0
WA-221-3	0	0	0

6.3 Analysis 3: Solar Array Sellards (West 2) PV Array Areas - First Story and Commuter Car View Results

Analysis 3 consisted of 18 PV Arrays (2-1 through 2-18), as viewed from five OPs at 6 feet above ground surface and seven segmented vehicular traffic routes at 5 feet above ground surface (Attachment B, Figure 2b).

Table 4 represents the glare summary in annual minutes of glare for Analysis 3. Based on the SGHAT results, no amounts of glare were predicted at the defined receptors.

Table 4. Analysis 3 Annual Minutes of Glare Summary – Solar Array Sellards

Receptor ID	Green Glare	Yellow Glare	Red Glare
141 (OP-1)	0	0	0
185 (OP-2)	0	0	0
737 (OP-3)	0	0	0
744 (OP-4)	0	0	0
195 (OP-5)	0	0	0
Sellards Road-1	0	0	0
Sellards Road-2	0	0	0
Sellards Road-3	0	0	0
S Travis Road-1	0	0	0
S Travis Road-2	0	0	0
WA-221-1	0	0	0
WA-221-2	0	0	0

6.4 Analysis 4: Solar Array Sellards (West 2) PV Array Areas - Second Story and Commercial Truck View Results

Analysis 4 included the same PV Arrays and the same receptor locations as Analysis 3, with the OP viewing height raised to 16 feet above ground surface and the segmented vehicular traffic route viewing height raised to 9 feet above ground surface (Attachment B, Figure 2b).

Table 5 represents the glare summary in annual minutes of glare for Analysis 4. Based on the SGHAT results, no amounts of glare were predicted at the defined receptors.

Table 5. Analysis 4 Annual Minutes of Glare Summary – Solar Array Sellards

Receptor ID	Green Glare	Yellow Glare	Red Glare
141 (OP-1)	0	0	0
185 (OP-2)	0	0	0
737 (OP-3)	0	0	0
744 (OP-4)	0	0	0
195 (OP-5)	0	0	0
Sellards Road-1	0	0	0
Sellards Road-2	0	0	0
Sellards Road-3	0	0	0
S Travis Road-1	0	0	0
S Travis Road-2	0	0	0
WA-221-`1	0	0	0
WA-221-2	0	0	0

6.5 Analyses 5 and 7: Solar Array East PV Array Areas - First Story and Commuter Car View Results

As noted in Section 4, the SGHAT constrains the number of drawn PV array areas to a maximum of 20 per analysis; thus, the Solar Array East area had to be divided two sets of PV arrays with two analyses each for the height variations, resulting in Analyses 5 through 8. Analysis 5 consisted of 17 PV Arrays (3-1 through 3-17), as viewed from six OPs at 6 feet above ground surface and seven segmented vehicular traffic routes at 5 feet above ground surface (Attachment B, Figure 2c). Analysis 7 consisted of 13 PV Arrays (4-1 through 4-13) as viewed from the same receptors at the same heights as Analysis 5 (Attachment B, Figure 2c).

Table 6 represents the glare summary in combined annual minutes of glare for Analysis 5 and 7. Based on the SGHAT results, no amounts of glare are predicted at any of the OPs or at the segmented vehicular routes.

Table 6. Analyses 5 and 7 Annual Minutes of Glare Summary – Solar Array East

Receptor	Green Glare	Yellow Glare	Red Glare
192 (OP-1)	0	0	0
215 (OP-2)	0	0	0
187 (OP-3)	0	0	0
178 (OP-4)	0	0	0
745 (OP-5)	0	0	0
195 (OP-6)	0	0	0
Beck Rd-1	0	0	0
Beck Rd-2	0	0	0
Beck Rd-3	0	0	0
US HWY 395-1	0	0	0
US HWY 395-2	0	0	0
US HWY 395-3	0	0	0
US HWY 395-4	0	0	0

6.6 Analyses 6 and 8: Solar Array East PV Array Areas - Second Story and Commercial Truck View Results

Analysis 6 included the same PV Arrays as Analysis 5 (3-1 through 3-17), and Analysis 8 included the same PV Arrays as Analysis 7 (4-1 through 4-13). The receptor locations remain the same across all four analyses. For both Analysis 6 and 8, the OP viewing height was raised to 16 feet above ground surface and the segmented vehicular traffic route viewing height was raised to 9 feet above ground surface (Attachment B, Figure 2c).

Table 7 represents the glare summary in combined annual minutes of glare for Analyses 6 and 8. Based on the SGHAT results, no amounts of glare were predicted at any of the defined receptors.

Table 7. Analyses 6 and 8 Annual Minutes of Glare Summary – Solar Array East

Receptor	Green Glare	Yellow Glare	Red Glare
192 (OP-1)	0	0	0
215 (OP-2)	0	0	0
187 (OP-3)	0	0	0
178 (OP-4)	0	0	0
745 (OP-5)	0	0	0
195 (OP-6)	0	0	0
Beck Rd-1	0	0	0
Beck Rd-2	0	0	0
Beck Rd-3	0	0	0
US HWY 395-1	0	0	0
US HWY 395-2	0	0	0
US HWY 395-3	0	0	0
US HWY 395-4	0	0	0

7 SUMMARY

The preliminary Project layout for the solar PV arrays was modeled using GlareGauge to evaluate the potential extent of glare the Project may cause to receptors at several OPs and segmented traffic routes representing proximal areas surrounding the Project.

In order to better analyze the potential for glare as a result of sunlight reflectance from the Project and accommodate GlareGauge conservatisms noted in Section 4.0, 60 PV Array Areas were modeled within the Project layout, which was broken down into three separate areas (i.e., Solar Array County Well [West 1], Solar Array Sellards [West 2], and Solar Array East). Eight separate glare analyses (i.e., Analysis 1 through Analysis 8) were performed to provide a quantitative assessment of the potential for glare as a result of the Project, based on views from first- and second-story structures, and commuter and commercial vehicles.

Based on the SGHAT results, all of the modeled receptors (OPs and vehicular routes) are predicted to not experience glare as a result of the Project. As previously noted, the GlareGauge model does not account for varying ambient conditions (i.e., cloudy days, precipitation), atmospheric attenuation, screening due to existing topography not located within the defined array layouts, or existing vegetation or structures (including fences or walls), nor does the tool allow proposed landscaping to be included; therefore, the predicted results are considered to be conservative. This means that the existing vegetation (crops) and topography of the surrounding area are not accounted for with the GlareGauge model and will most likely have a significant impact on glare reduction from receptors. In addition, the Project was modeled with backtracking (i.e., the modules reverted back to 10-degree position [resting angle] when the sun is outside of the tracking range). The sun is outside of the 50-degree maximum tracking range in the early morning hours (until approximately 8:00 AM) and in the late evening hours of the day (beginning at approximately 7:00 PM). The GlareGauge model assumes that backtracking to the resting angle will be instantaneous, when in fact the process will be slower, resulting in less glare experienced than predicted. The module backtracking program that will be implemented on the Project detects the rising sun light and begins to tilt the modules out of the resting position until they reach the maximum tracking angle (50 degrees) facing east around 8:00 to 8:30 AM. Subsequently, as the modules track to the east, western receptors will experience less glare prior to 8:00 AM because the receptor will be observing the back of the modules. Likewise, in the evening hours, the eastern receptors will experience less glare from approximately 6:00

PM to 8:00 PM as the modules slowly backtrack to the resting angle. In general, tracking and backtracking at a slower pace than assumed by GlareGauge will result in significantly less glare experienced than predicted. Therefore, the representation of backtracking using an immediate 10 degree revert position is also a conservative approach to predicting glare at the surrounding receptors.

As noted in Section 2.0, the FAA has developed the following criteria (78 FR 63276) for analysis of solar energy projects located on jurisdictional airports:

- No potential for glint or glare in the existing or planned Air Traffic Control Tower cab; and
- No potential for glare or “low potential for after-image” along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan.

Based on the results of the FAA NCT, the Project does not exceed notice criteria and a formal filing is not necessary.

8 REFERENCES

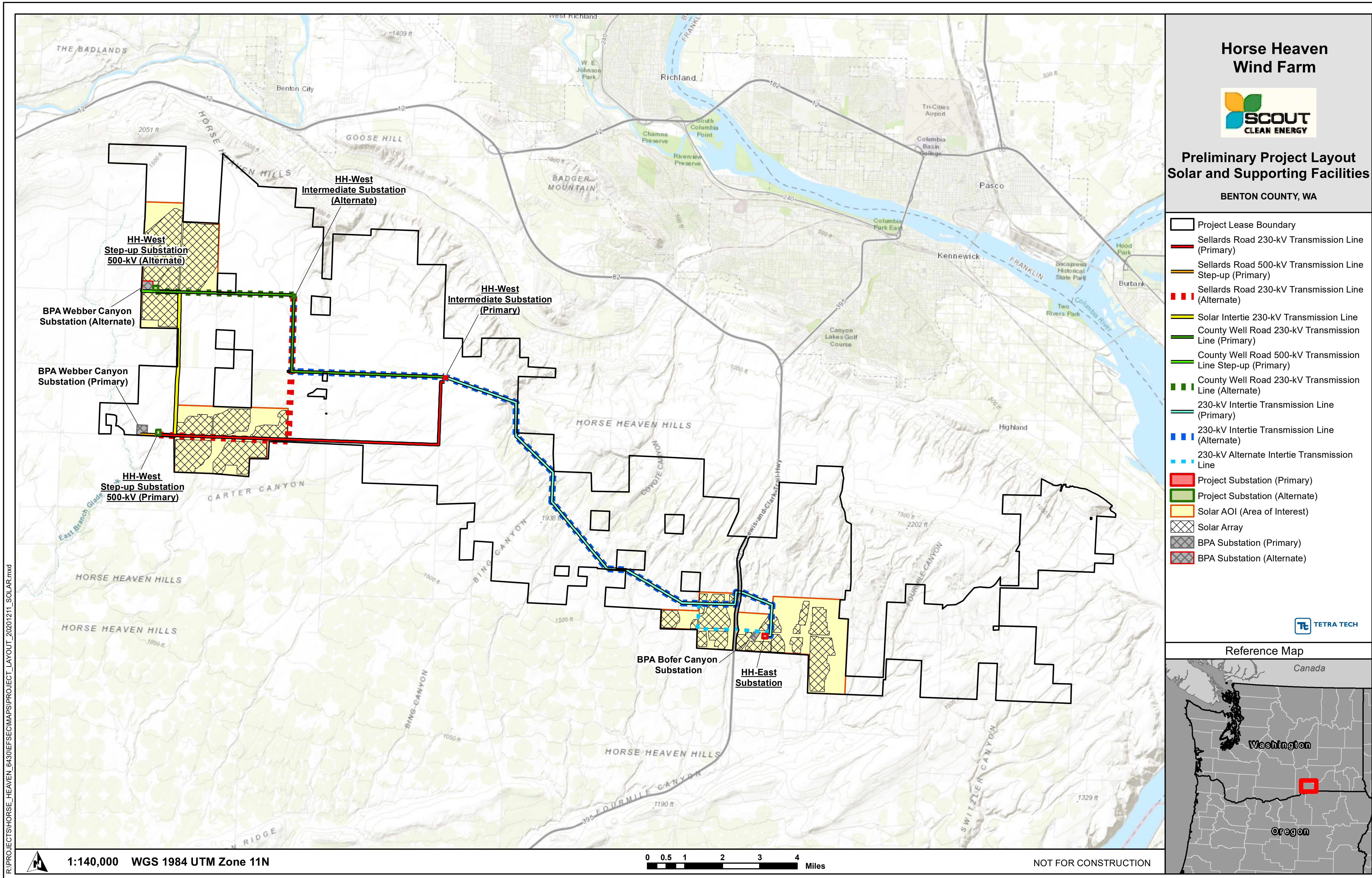
FAA (Federal Aviation Administration). 2010. Technical Guidance for Evaluating Selected Solar Technologies on Airports. Office of Airports, Office of Airport Planning and Programming, Airport Planning and Environmental Division (APP-400). November.

FAA. 2020. Notice Criteria Tool hosted by Federal Aviation Administration. Accessed online https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showNoNoticeRequiredToolForm

ForgeSolar. 2020. Sandia Solar Glare Hazard Analysis Tool, GlareGauge hosted by ForgeSolar. Accessed online https://www.forgesolar.com/.

Sandia (Sandia National Laboratories). 2016. Solar Glare Hazard Analysis Tool (SGHAT) User’s Manual v. 3.0. December 6, 2016.

ATTACHMENT A
PRELIMINARY SITE PLAN


Horse Heaven Wind Farm
SCOUT CLEAN ENERGY
Preliminary Project Layout
Solar and Supporting Facilities
BENTON COUNTY, WA
Project Lease Boundary
Sellards Road 230-kV Transmission Line (Primary)
Sellards Road 500-kV Transmission Line Step-up (Primary)
Sellards Road 230-kV Transmission Line (Alternate)
Solar Intertie 230-kV Transmission Line
County Well Road 230-kV Transmission Line (Primary)
County Well Road 500-kV Transmission Line Step-up (Primary)
County Well Road 230-kV Transmission Line (Alternate)
230-kV Intertie Transmission Line (Primary)
230-kV Intertie Transmission Line (Alternate)
230-kV Alternate Intertie Transmission Line
Project Substation (Primary)
Project Substation (Alternate)
Solar AOI (Area of Interest)
Solar Array
BPA Substation (Primary)
BPA Substation (Alternate)
TETRA TECH
Reference Map
Canada
Washington
Oregon
HH-West Intermediate Substation (Alternate)
HH-West Step-up Substation 500-kV (Alternate)
BPA Webber Canyon Substation (Alternate)
BPA Webber Canyon Substation (Primary)
HH-West Intermediate Substation (Primary)
HH-West Step-up Substation 500-kV (Primary)
BPA Bofer Canyon Substation
HH-East Substation
THE BADLANDS
Benton City
GOOSE HILL
HORSE HEAVEN HILLS
BADGER MOUNTAIN
Richland
Pasco
Kennewick
Burbank
Highland
CARTER CANYON
BING CANYON
COYOTE CANYON
FOURMILE CANYON
SWITZLER CANYON
Lewis and Clark Trail Hwy
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0 0.5 1 2 3 4 Miles
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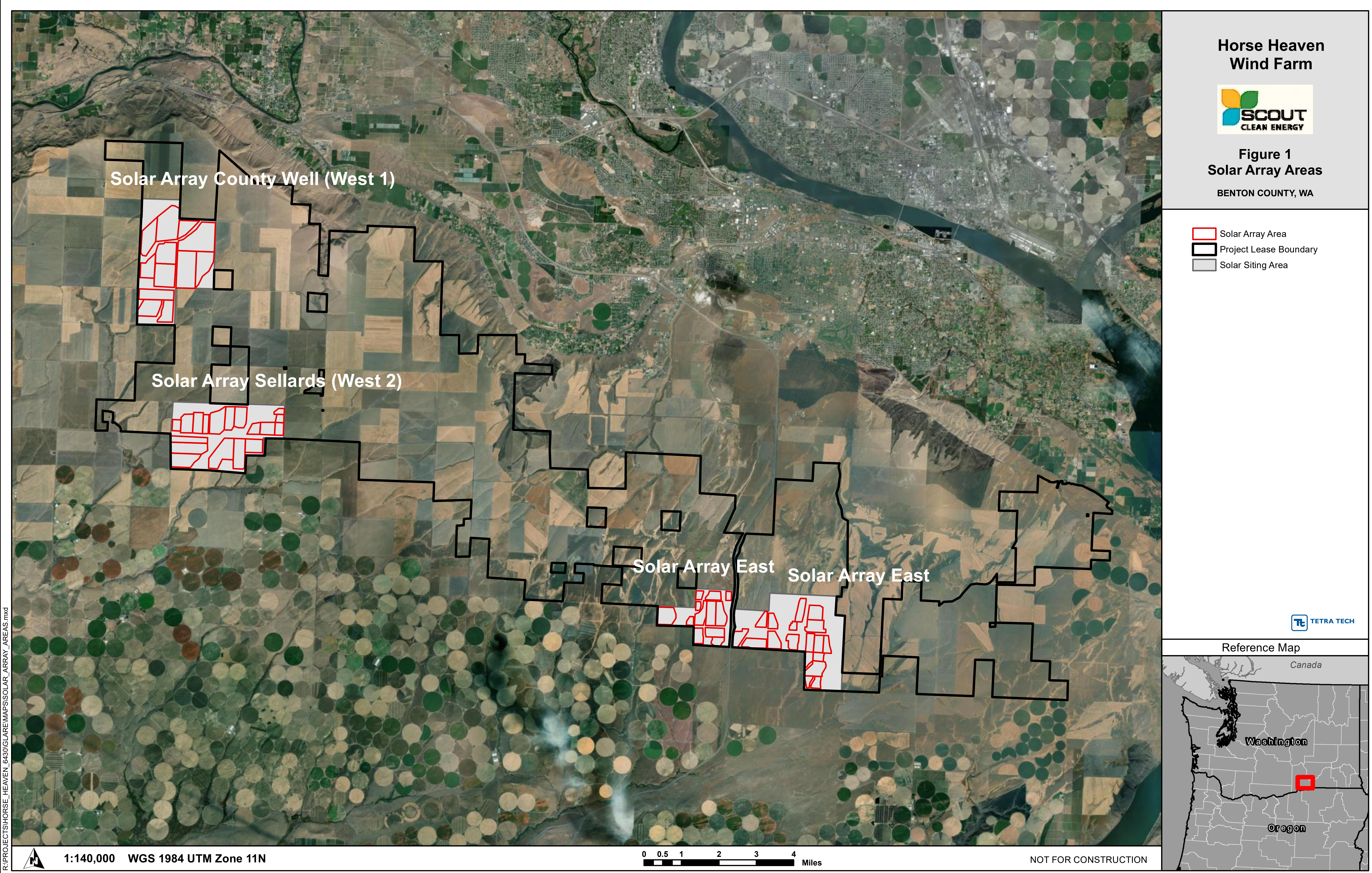
ATTACHMENT B
FIGURES


Horse Heaven
Wind Farm
SCOUT CLEAN ENERGY
Figure 1
Solar Array Areas
BENTON COUNTY, WA
Solar Array Area
Project Lease Boundary
Solar Siting Area
Solar Array County Well (West 1)
Solar Array Sellards (West 2)
Solar Array East
Solar Array East
TETRA TECH
Reference Map
Canada
Washington
Oregon
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Miles
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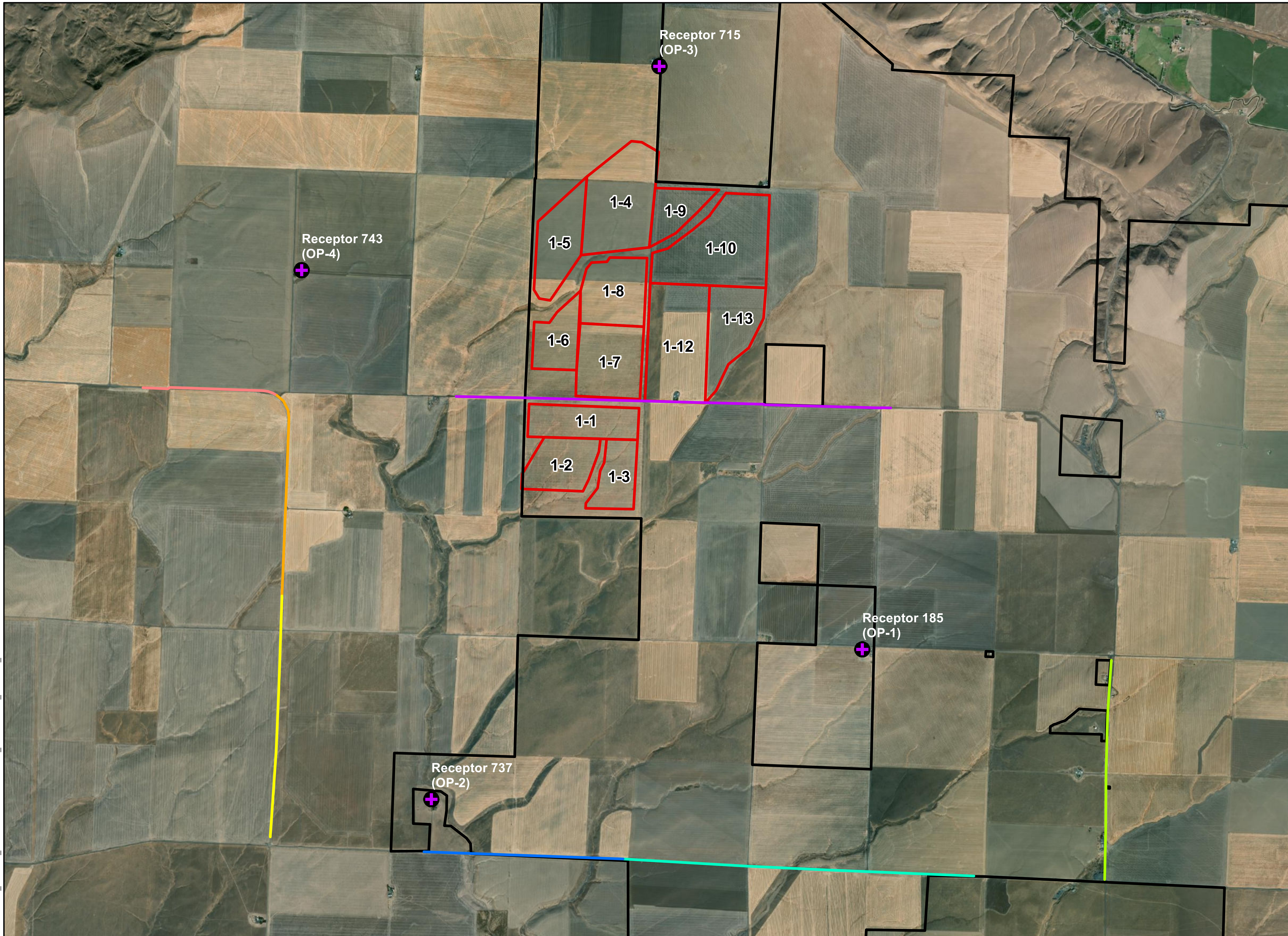

Horse Heaven Wind Farm

SCOUT CLEAN ENERGY

Figure 2a
Glare Receptors
Solar Array County Well
(West 1)

BENTON COUNTY, WA

Project Lease Boundary
Solar Array Area

Residential Receptors
Observation Point

Road Receptors*
Country_Well_Rd
S_Travis_Rd-1
Sellards_Road-1
Sellards_Road-2
WA-221-1
WA-221-2a
WA-221-3

* The actual width of the road receptors shown in this figure are smaller than they appear, as the highlighted roads receptors have been enlarged in this figure to aid in readability.

TETRA TECH

1:50,000 WGS 1984 UTM Zone 11N

NOT FOR CONSTRUCTION

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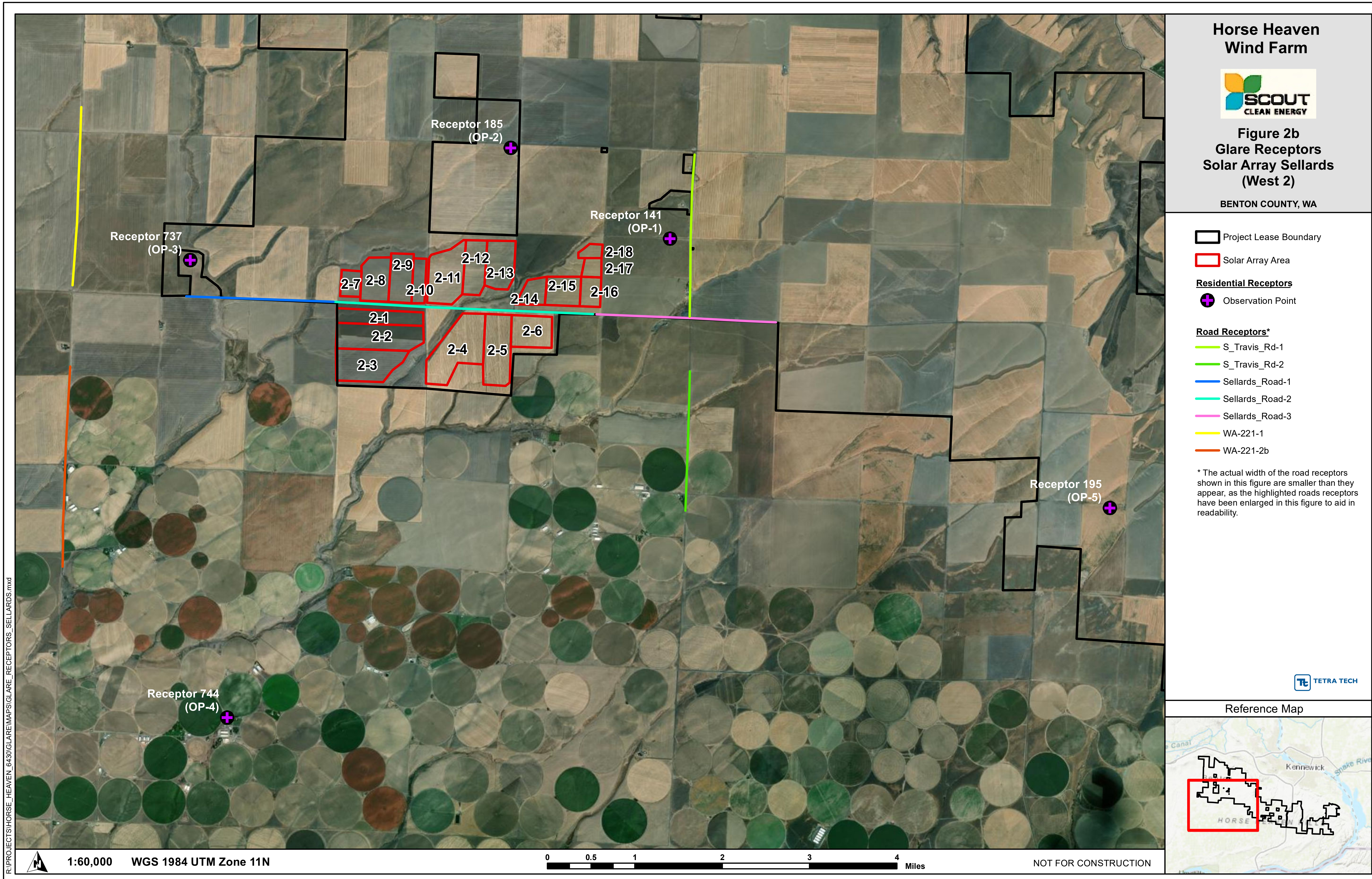
Horse Heaven Wind Farm
SCOUT CLEAN ENERGY
Figure 2b
Glare Receptors
Solar Array Sellards
(West 2)
BENTON COUNTY, WA
Project Lease Boundary
Solar Array Area
Residential Receptors
Observation Point
Road Receptors*
S_Travis_Rd-1
S_Travis_Rd-2
Sellards_Road-1
Sellards_Road-2
Sellards_Road-3
WA-221-1
WA-221-2b
* The actual width of the road receptors shown in this figure are smaller than they appear, as the highlighted roads receptors have been enlarged in this figure to aid in readability.
TETRA TECH
Reference Map
Kennewick
Receptor 185 (OP-2)
Receptor 141 (OP-1)
Receptor 737 (OP-3)
Receptor 195 (OP-5)
Receptor 744 (OP-4)
2-1
2-2
2-3
2-4
2-5
2-6
2-7
2-8
2-9
2-10
2-11
2-12
2-13
2-14
2-15
2-16
2-17
2-18
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WGS 1984 UTM Zone 11N
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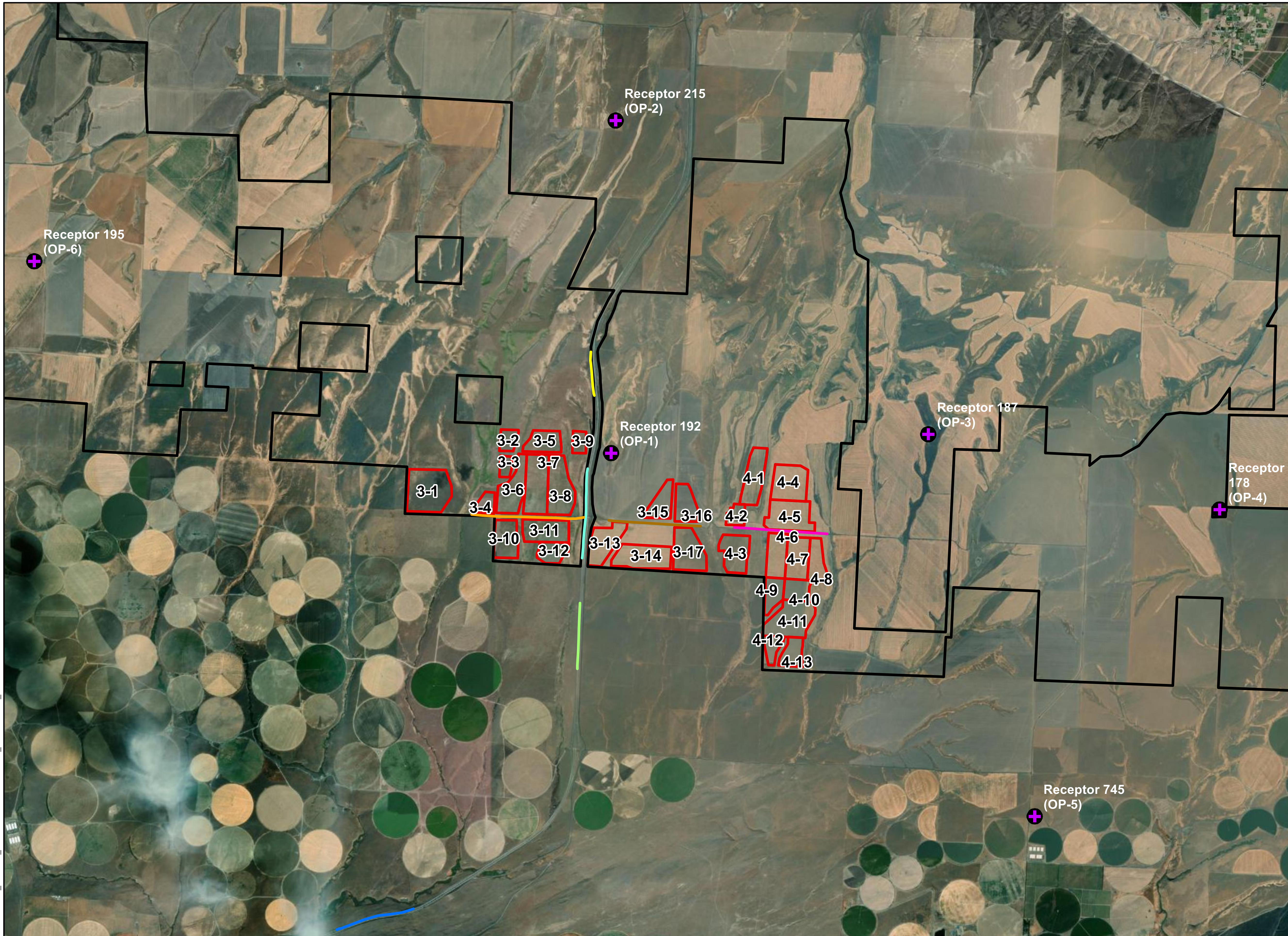

Horse Heaven Wind Farm

SCOUT CLEAN ENERGY

Figure 2c
Glare Receptors Solar Array East

BENTON COUNTY, WA

Project Lease Boundary

Solar Array Area

Residential Receptors

Observation Point

Road Receptors*

Becks_Rd-1

Becks_Rd-2

Becks_Rd-3

US_HWY_395-1

US_HWY_395-2

US_HWY_395-3

US_HWY_395-4

* The actual width of the road receptors shown in this figure are smaller than they appear, as the highlighted roads receptors have been enlarged in this figure to aid in readability.

TETRA TECH

1:65,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

NOT FOR CONSTRUCTION

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ATTACHMENT C
FORGESOLAR GLARE ANALYSIS REPORTS

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven West 1-1st**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 04:05 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

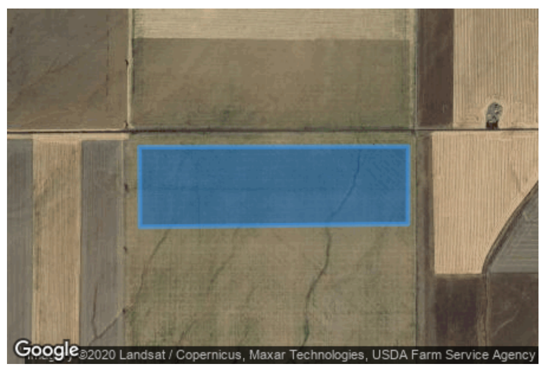
SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46876.8449

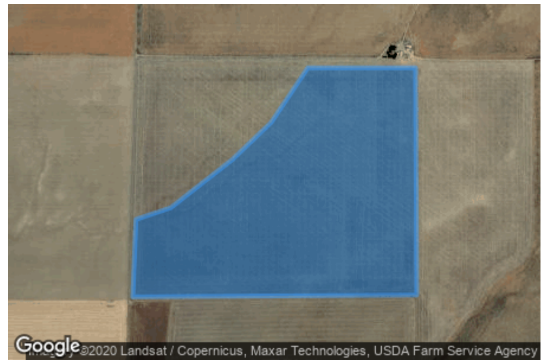
PV Array(s)

Name: PV array 1-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



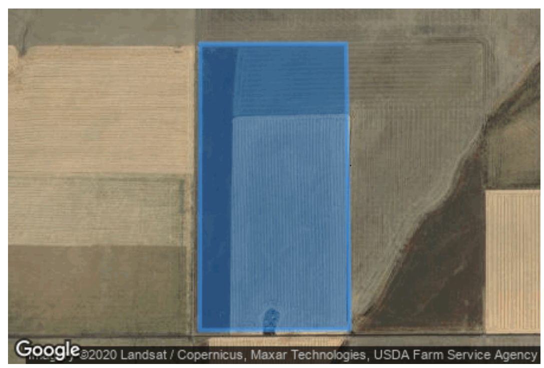
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.186226	-119.558406	1361.27	7.00	1368.27
2	46.186256	-119.538880	1389.29	7.00	1396.29
3	46.182364	-119.538880	1372.25	7.00	1379.25
4	46.182215	-119.558364	1346.31	7.00	1353.31

Name: PV array 1-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.2°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.213261	-119.525075	1464.23	7.00	1471.23
2	46.213261	-119.517264	1469.49	7.00	1476.49
3	46.201886	-119.517178	1478.00	7.00	1485.00
4	46.201797	-119.537777	1452.42	7.00	1459.42
5	46.205673	-119.537541	1435.13	7.00	1442.13
6	46.206252	-119.535031	1435.99	7.00	1442.99
7	46.208658	-119.530568	1450.69	7.00	1457.69
8	46.210529	-119.527735	1455.28	7.00	1462.28

Name: PV array 1-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

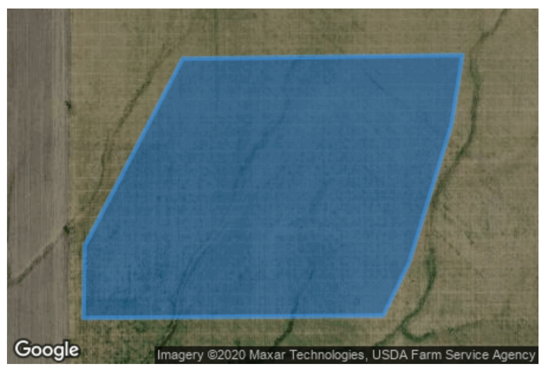


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.201745	-119.537781	1452.74	7.00	1459.74
2	46.201745	-119.527181	1488.16	7.00	1495.16
3	46.187426	-119.526923	1391.33	7.00	1398.33
4	46.187367	-119.537824	1396.71	7.00	1403.71

Name: PV array 1-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.201884	-119.527277	1486.99	7.00	1493.99
2	46.201944	-119.517234	1477.58	7.00	1484.58
3	46.198082	-119.517320	1444.74	7.00	1451.74
4	46.194339	-119.519981	1428.46	7.00	1435.46
5	46.192141	-119.522985	1417.08	7.00	1424.09
6	46.188992	-119.525217	1401.43	7.00	1408.44
7	46.187447	-119.526976	1392.25	7.00	1399.25

Name: PV array 1-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

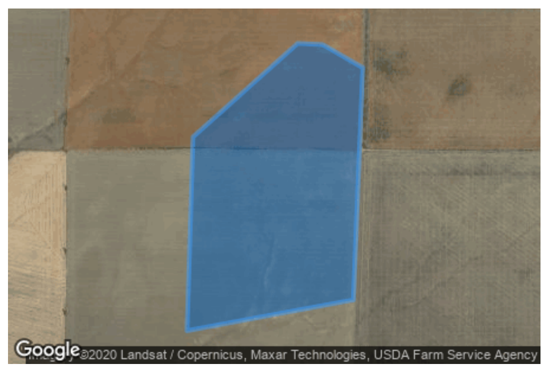


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.182274	-119.555274	1348.90	7.00	1355.90
2	46.177580	-119.558836	1327.94	7.00	1334.94
3	46.175767	-119.558879	1325.17	7.00	1332.17
4	46.175826	-119.547978	1326.17	7.00	1333.17
5	46.177164	-119.547034	1332.79	7.00	1339.79
6	46.180640	-119.545489	1350.21	7.00	1357.21
7	46.182364	-119.545103	1358.34	7.00	1365.34

Name: PV array 1-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

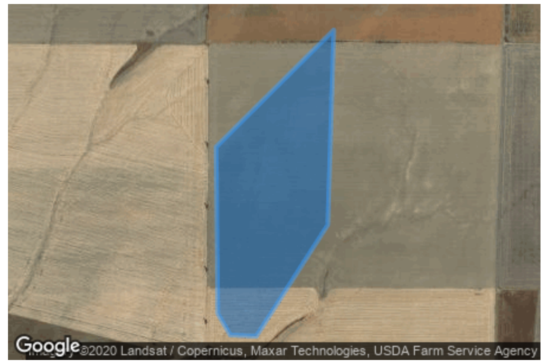
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.182334	-119.544073	1355.58	7.00	1362.58
2	46.179600	-119.544416	1343.33	7.00	1350.33
3	46.178471	-119.545060	1344.26	7.00	1351.26
4	46.176302	-119.545360	1332.42	7.00	1339.42
5	46.174281	-119.547334	1327.65	7.00	1334.65
6	46.173806	-119.547377	1331.44	7.00	1338.44
7	46.173865	-119.538751	1348.97	7.00	1355.97
8	46.182423	-119.538837	1372.51	7.00	1379.51

Name: PV array 1-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



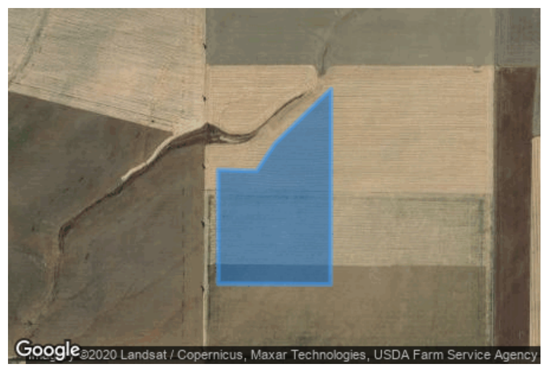
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.206362	-119.538174	1441.16	7.00	1448.16
2	46.218003	-119.537488	1503.05	7.00	1510.05
3	46.219161	-119.540406	1525.83	7.00	1532.83
4	46.219220	-119.542208	1523.71	7.00	1530.71
5	46.214529	-119.549804	1493.85	7.00	1500.85
6	46.204817	-119.550233	1427.67	7.00	1434.67

Name: PV array 1-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.46°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



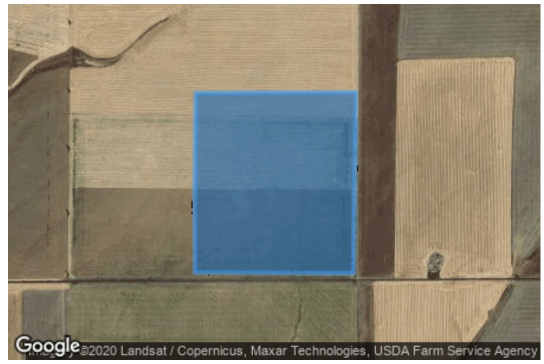
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.200362	-119.558302	1416.39	7.00	1423.39
2	46.199293	-119.557400	1406.00	7.00	1413.00
3	46.199233	-119.555512	1413.98	7.00	1420.98
4	46.204817	-119.550319	1427.75	7.00	1434.75
5	46.214558	-119.549890	1493.74	7.00	1500.74
6	46.208708	-119.558430	1482.25	7.00	1489.25

Name: PV array 1-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



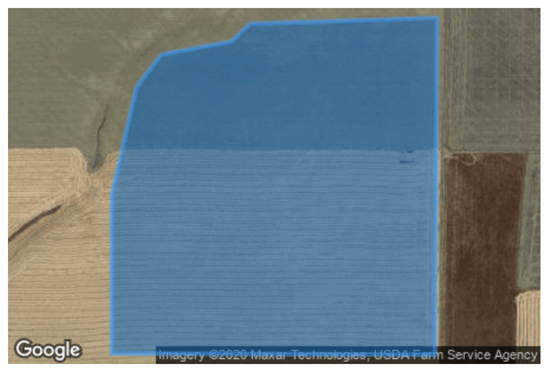
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.200456	-119.549994	1414.14	7.00	1421.14
2	46.190683	-119.550037	1389.49	7.00	1396.49
3	46.190712	-119.558191	1373.62	7.00	1380.62
4	46.196416	-119.558191	1407.05	7.00	1414.05
5	46.196357	-119.555401	1409.91	7.00	1416.91
6	46.197723	-119.554071	1412.48	7.00	1419.48
7	46.199060	-119.552097	1418.14	7.00	1425.14

Name: PV array 1-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.46°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



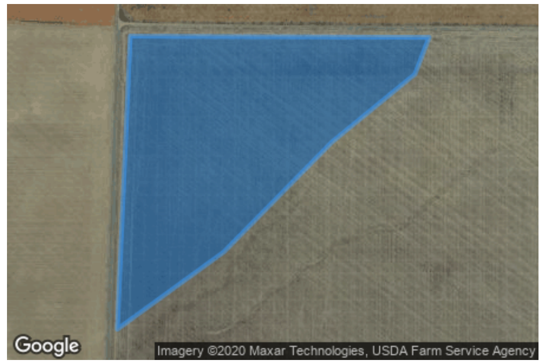
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.190742	-119.550123	1390.05	7.00	1397.05
2	46.187444	-119.550080	1375.64	7.00	1382.64
3	46.187415	-119.538578	1392.91	7.00	1399.91
4	46.196476	-119.538407	1433.60	7.00	1440.60
5	46.196446	-119.550037	1435.72	7.00	1442.72

Name: PV array 1-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.196505	-119.550080	1435.49	7.00	1442.49
2	46.196476	-119.538364	1434.33	7.00	1441.33
3	46.204911	-119.538278	1431.71	7.00	1438.71
4	46.204763	-119.545059	1424.34	7.00	1431.34
5	46.204317	-119.545745	1428.41	7.00	1435.41
6	46.203991	-119.548277	1424.69	7.00	1431.69
7	46.203189	-119.549179	1422.57	7.00	1429.57
8	46.200486	-119.550080	1412.92	7.00	1419.92

Name: PV array 1-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.213558	-119.537091	1464.05	7.00	1471.05
2	46.213528	-119.526233	1460.74	7.00	1467.74
3	46.212608	-119.526748	1464.19	7.00	1471.19
4	46.210915	-119.529752	1454.38	7.00	1461.38
5	46.208153	-119.533701	1445.36	7.00	1452.36
6	46.206223	-119.537563	1440.36	7.00	1447.36

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.157483	-119.496755	1415.78	6.00
OP 2	2	46.136308	-119.572725	1188.75	6.00
OP 3	3	46.228568	-119.537703	1473.44	6.00
OP 4	4	46.201261	-119.599865	1347.21	6.00

Route Receptor(s)

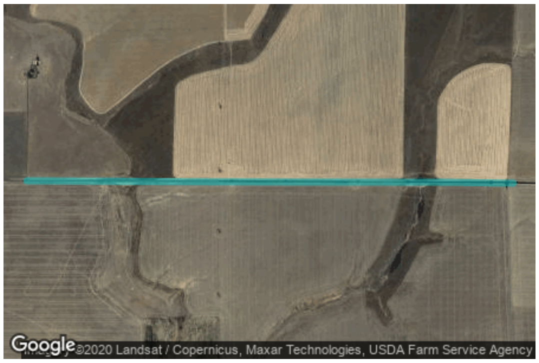
Name: Country Well Rd
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.186942	-119.571627	1317.23	5.00	1322.23
2	46.186972	-119.558538	1363.75	5.00	1368.75
3	46.187061	-119.541157	1385.48	5.00	1390.48
4	46.187061	-119.531201	1399.83	5.00	1404.83
5	46.187120	-119.521502	1423.59	5.00	1428.59
6	46.187135	-119.508649	1435.66	5.00	1440.66
7	46.187165	-119.499529	1447.66	5.00	1452.66
8	46.187180	-119.493908	1455.78	5.00	1460.78

Name: Sellards Road 1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130963	-119.573374	1183.15	5.00	1188.15
2	46.130919	-119.562151	1181.49	5.00	1186.49
3	46.130904	-119.554555	1215.70	5.00	1220.70
4	46.130889	-119.542899	1221.76	5.00	1226.76
5	46.130844	-119.538050	1246.26	5.00	1251.26

Name: Sellards Road 2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130844	-119.537878	1247.08	5.00	1252.09
2	46.130696	-119.530857	1270.87	5.00	1275.87
3	46.130547	-119.521759	1298.29	5.00	1303.29
4	46.130443	-119.515729	1303.92	5.00	1308.92
5	46.130370	-119.508138	1302.79	5.00	1307.79
6	46.130281	-119.499812	1345.74	5.00	1350.74
7	46.130221	-119.492731	1360.96	5.00	1365.96
8	46.130177	-119.483955	1386.73	5.00	1391.73
9	46.130117	-119.475694	1406.43	5.00	1411.43

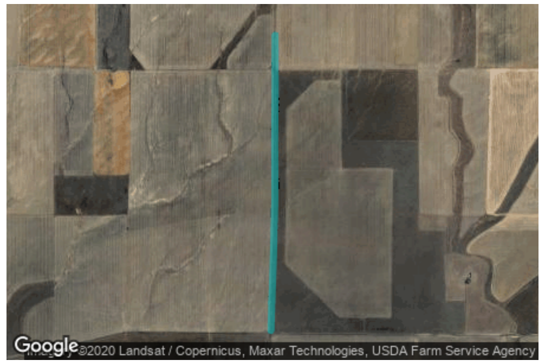
Name: S Travis Road-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.158019	-119.454002	1504.91	5.00	1509.91
2	46.155270	-119.454195	1512.40	5.00	1517.40
3	46.151152	-119.454667	1487.89	5.00	1492.89
4	46.147584	-119.454753	1498.02	5.00	1503.02
5	46.142991	-119.454688	1492.24	5.00	1497.24
6	46.136984	-119.454495	1455.52	5.00	1460.52
7	46.131308	-119.454323	1437.90	5.00	1442.90

Name: WA-221-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.161059	-119.600993	1218.15	5.00	1223.15
2	46.155946	-119.600993	1197.87	5.00	1202.87
3	46.150446	-119.601057	1172.58	5.00	1177.58
4	46.145035	-119.601014	1147.99	5.00	1152.99
5	46.139043	-119.601229	1127.91	5.00	1132.91
6	46.135178	-119.601422	1111.14	5.00	1116.14
7	46.131490	-119.601594	1098.20	5.00	1103.20

Name: WA-221-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.161258	-119.601002	1220.31	5.00	1225.31
2	46.165909	-119.600938	1232.02	5.00	1237.02
3	46.170902	-119.600895	1251.25	5.00	1256.25
4	46.178436	-119.600916	1294.24	5.00	1299.24
5	46.183985	-119.600938	1328.54	5.00	1333.54
6	46.184743	-119.601281	1334.45	5.00	1339.45
7	46.185560	-119.601968	1335.54	5.00	1340.54
8	46.186110	-119.602890	1339.61	5.00	1344.61

Name: WA-221-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.186273	-119.603363	1338.88	5.00	1343.88
2	46.186615	-119.604457	1338.58	5.00	1343.58
3	46.186749	-119.605937	1332.06	5.00	1337.06
4	46.186689	-119.611280	1330.41	5.00	1335.41
5	46.186674	-119.615701	1344.05	5.00	1349.05
6	46.186674	-119.622095	1349.76	5.00	1354.76
7	46.186719	-119.626730	1353.10	5.00	1358.10

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1-1	SA tracking	SA tracking	0	0	-
PV array 1-10	SA tracking	SA tracking	0	0	-
PV array 1-11	SA tracking	SA tracking	0	0	-
PV array 1-12	SA tracking	SA tracking	0	0	-
PV array 1-2	SA tracking	SA tracking	0	0	-
PV array 1-3	SA tracking	SA tracking	0	0	-
PV array 1-4	SA tracking	SA tracking	0	0	-
PV array 1-5	SA tracking	SA tracking	0	0	-
PV array 1-6	SA tracking	SA tracking	0	0	-
PV array 1-7	SA tracking	SA tracking	0	0	-
PV array 1-8	SA tracking	SA tracking	0	0	-
PV array 1-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Results for: PV array 1-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare

0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare

0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 1-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size.
Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven West 1-2nd**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 04:06 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

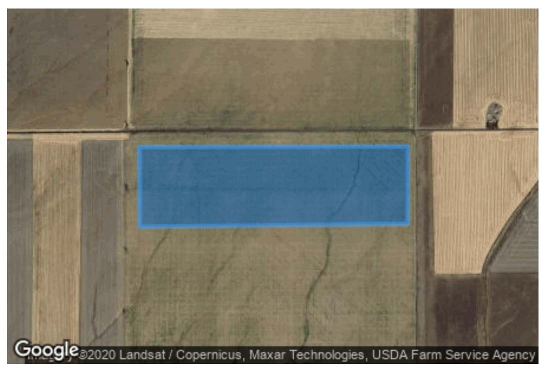
SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46938.8449

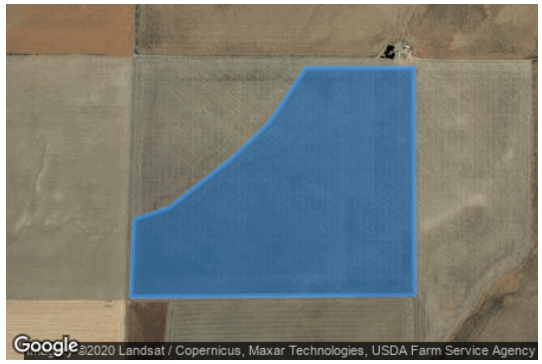
PV Array(s)

Name: PV array 1-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



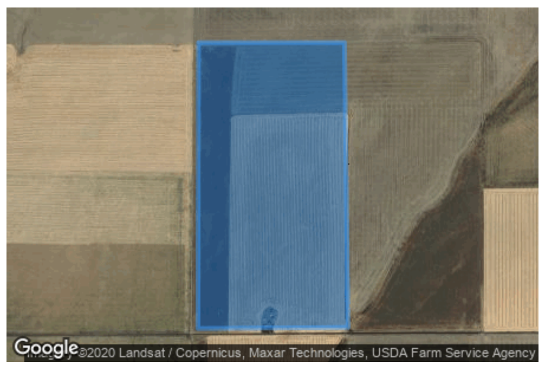
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.186226	-119.558406	1361.27	7.00	1368.27
2	46.186256	-119.538880	1389.29	7.00	1396.29
3	46.182364	-119.538880	1372.25	7.00	1379.25
4	46.182215	-119.558364	1346.31	7.00	1353.31

Name: PV array 1-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.2°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.213261	-119.525075	1464.23	7.00	1471.23
2	46.213261	-119.517264	1469.49	7.00	1476.49
3	46.201886	-119.517178	1478.00	7.00	1485.00
4	46.201797	-119.537777	1452.42	7.00	1459.42
5	46.205673	-119.537541	1435.13	7.00	1442.13
6	46.206252	-119.535031	1435.99	7.00	1442.99
7	46.208658	-119.530568	1450.69	7.00	1457.69
8	46.210529	-119.527735	1455.28	7.00	1462.28

Name: PV array 1-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

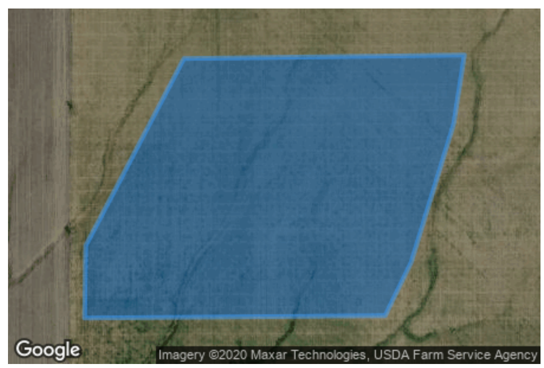


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.201745	-119.537781	1452.74	7.00	1459.74
2	46.201745	-119.527181	1488.16	7.00	1495.16
3	46.187426	-119.526923	1391.33	7.00	1398.33
4	46.187367	-119.537824	1396.71	7.00	1403.71

Name: PV array 1-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.201884	-119.527277	1486.99	7.00	1493.99
2	46.201944	-119.517234	1477.58	7.00	1484.58
3	46.198082	-119.517320	1444.74	7.00	1451.74
4	46.194339	-119.519981	1428.46	7.00	1435.46
5	46.192141	-119.522985	1417.08	7.00	1424.09
6	46.188992	-119.525217	1401.43	7.00	1408.44
7	46.187447	-119.526976	1392.25	7.00	1399.25

Name: PV array 1-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

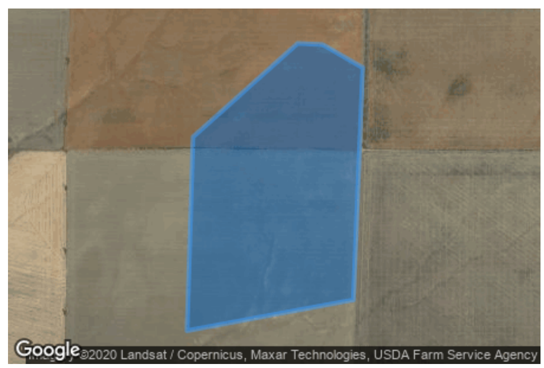


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.182274	-119.555274	1348.90	7.00	1355.90
2	46.177580	-119.558836	1327.94	7.00	1334.94
3	46.175767	-119.558879	1325.17	7.00	1332.17
4	46.175826	-119.547978	1326.17	7.00	1333.17
5	46.177164	-119.547034	1332.79	7.00	1339.79
6	46.180640	-119.545489	1350.21	7.00	1357.21
7	46.182364	-119.545103	1358.34	7.00	1365.34

Name: PV array 1-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

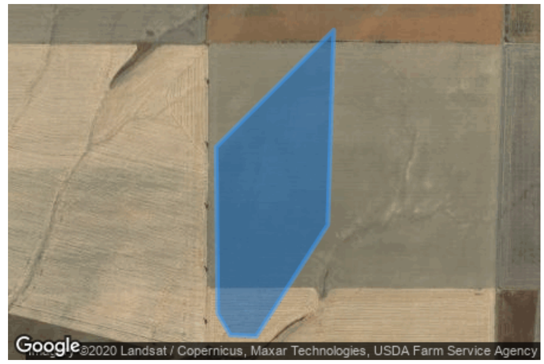
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.182334	-119.544073	1355.58	7.00	1362.58
2	46.179600	-119.544416	1343.33	7.00	1350.33
3	46.178471	-119.545060	1344.26	7.00	1351.26
4	46.176302	-119.545360	1332.42	7.00	1339.42
5	46.174281	-119.547334	1327.65	7.00	1334.65
6	46.173806	-119.547377	1331.44	7.00	1338.44
7	46.173865	-119.538751	1348.97	7.00	1355.97
8	46.182423	-119.538837	1372.51	7.00	1379.51

Name: PV array 1-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



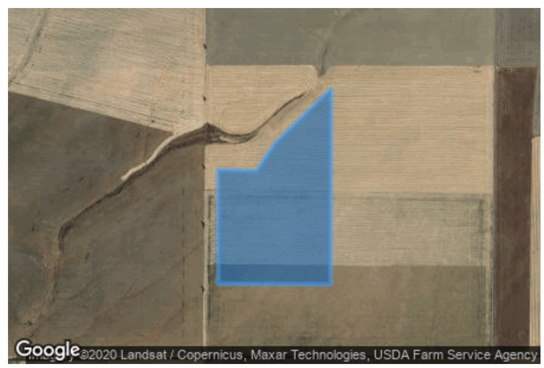
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.206362	-119.538174	1441.16	7.00	1448.16
2	46.218003	-119.537488	1503.05	7.00	1510.05
3	46.219161	-119.540406	1525.83	7.00	1532.83
4	46.219220	-119.542208	1523.71	7.00	1530.71
5	46.214529	-119.549804	1493.85	7.00	1500.85
6	46.204817	-119.550233	1427.67	7.00	1434.67

Name: PV array 1-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.46°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



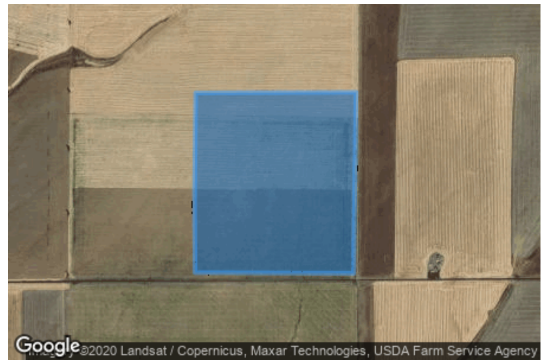
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.200362	-119.558302	1416.39	7.00	1423.39
2	46.199293	-119.557400	1406.00	7.00	1413.00
3	46.199233	-119.555512	1413.98	7.00	1420.98
4	46.204817	-119.550319	1427.75	7.00	1434.75
5	46.214558	-119.549890	1493.74	7.00	1500.74
6	46.208708	-119.558430	1482.25	7.00	1489.25

Name: PV array 1-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



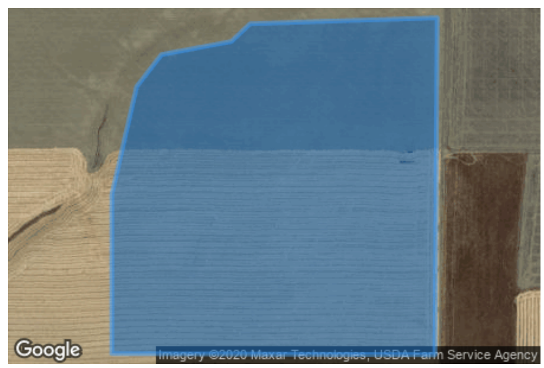
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.200456	-119.549994	1414.14	7.00	1421.14
2	46.190683	-119.550037	1389.49	7.00	1396.49
3	46.190712	-119.558191	1373.62	7.00	1380.62
4	46.196416	-119.558191	1407.05	7.00	1414.05
5	46.196357	-119.555401	1409.91	7.00	1416.91
6	46.197723	-119.554071	1412.48	7.00	1419.48
7	46.199060	-119.552097	1418.14	7.00	1425.14

Name: PV array 1-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.46°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



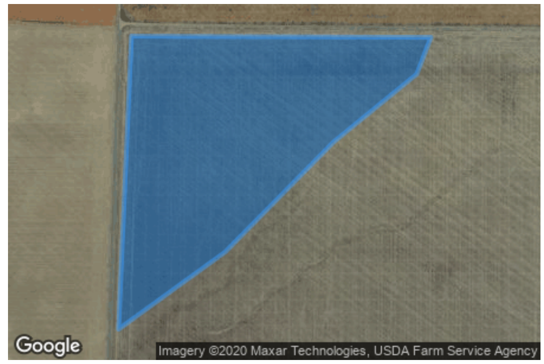
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.190742	-119.550123	1390.05	7.00	1397.05
2	46.187444	-119.550080	1375.64	7.00	1382.64
3	46.187415	-119.538578	1392.91	7.00	1399.91
4	46.196476	-119.538407	1433.60	7.00	1440.60
5	46.196446	-119.550037	1435.72	7.00	1442.72

Name: PV array 1-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.196505	-119.550080	1435.49	7.00	1442.49
2	46.196476	-119.538364	1434.33	7.00	1441.33
3	46.204911	-119.538278	1431.71	7.00	1438.71
4	46.204763	-119.545059	1424.34	7.00	1431.34
5	46.204317	-119.545745	1428.41	7.00	1435.41
6	46.203991	-119.548277	1424.69	7.00	1431.69
7	46.203189	-119.549179	1422.57	7.00	1429.57
8	46.200486	-119.550080	1412.92	7.00	1419.92

Name: PV array 1-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.213558	-119.537091	1464.05	7.00	1471.05
2	46.213528	-119.526233	1460.74	7.00	1467.74
3	46.212608	-119.526748	1464.19	7.00	1471.19
4	46.210915	-119.529752	1454.38	7.00	1461.38
5	46.208153	-119.533701	1445.36	7.00	1452.36
6	46.206223	-119.537563	1440.36	7.00	1447.36

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.157483	-119.496755	1415.78	16.00
OP 2	2	46.136308	-119.572725	1188.75	16.00
OP 3	3	46.228568	-119.537703	1473.44	16.00
OP 4	4	46.201261	-119.599865	1347.21	16.00

Route Receptor(s)

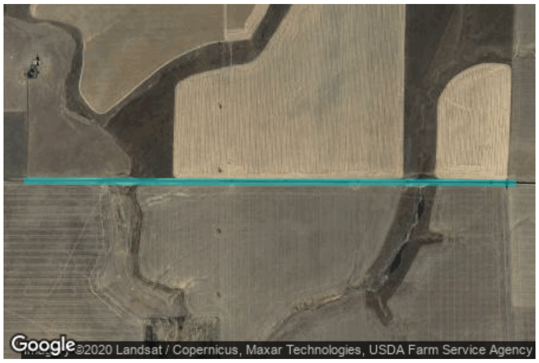
Name: Country Well Rd
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.186942	-119.571627	1317.23	9.00	1326.23
2	46.186972	-119.558538	1363.75	9.00	1372.75
3	46.187061	-119.541157	1385.48	9.00	1394.48
4	46.187061	-119.531201	1399.83	9.00	1408.83
5	46.187120	-119.521502	1423.59	9.00	1432.59
6	46.187135	-119.508649	1435.66	9.00	1444.66
7	46.187165	-119.499529	1447.66	9.00	1456.66
8	46.187180	-119.493908	1455.78	9.00	1464.78

Name: Sellards Road 1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130963	-119.573374	1183.15	9.00	1192.15
2	46.130919	-119.562151	1181.49	9.00	1190.49
3	46.130904	-119.554555	1215.70	9.00	1224.70
4	46.130889	-119.542899	1221.76	9.00	1230.76
5	46.130844	-119.538050	1246.26	9.00	1255.26

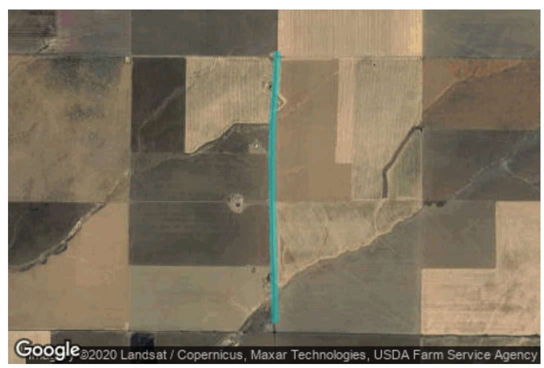
Name: Sellards Road 2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130844	-119.537878	1247.08	9.00	1256.09
2	46.130696	-119.530857	1270.87	9.00	1279.87
3	46.130547	-119.521759	1298.29	9.00	1307.29
4	46.130443	-119.515729	1303.92	9.00	1312.92
5	46.130370	-119.508138	1302.79	9.00	1311.79
6	46.130281	-119.499812	1345.74	9.00	1354.74
7	46.130221	-119.492731	1360.96	9.00	1369.96
8	46.130177	-119.483955	1386.73	9.00	1395.73
9	46.130117	-119.475694	1406.43	9.00	1415.43

Name: S Travis Road-1
Path type: Two-way
Observer view angle: 50.0°

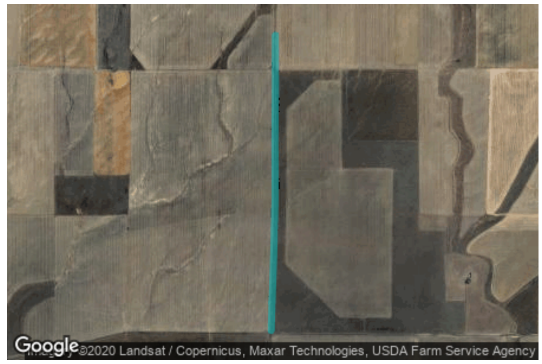
Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.158019	-119.454002	1504.91	9.00	1513.91
2	46.155270	-119.454195	1512.40	9.00	1521.40
3	46.151152	-119.454667	1487.89	9.00	1496.89
4	46.147584	-119.454753	1498.02	9.00	1507.02
5	46.142991	-119.454688	1492.24	9.00	1501.24
6	46.136984	-119.454495	1455.52	9.00	1464.52
7	46.131308	-119.454323	1437.90	9.00	1446.90

Name: WA-221-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.161059	-119.600993	1218.15	9.00	1227.15
2	46.155946	-119.600993	1197.87	9.00	1206.87
3	46.150446	-119.601057	1172.58	9.00	1181.58
4	46.145035	-119.601014	1147.99	9.00	1156.99
5	46.139043	-119.601229	1127.91	9.00	1136.91
6	46.135178	-119.601422	1111.14	9.00	1120.14
7	46.131490	-119.601594	1098.20	9.00	1107.20

Name: WA-221-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.161258	-119.601002	1220.31	9.00	1229.31
2	46.165909	-119.600938	1232.02	9.00	1241.02
3	46.170902	-119.600895	1251.25	9.00	1260.25
4	46.178436	-119.600916	1294.24	9.00	1303.24
5	46.183985	-119.600938	1328.54	9.00	1337.54
6	46.184743	-119.601281	1334.45	9.00	1343.45
7	46.185560	-119.601968	1335.54	9.00	1344.54
8	46.186110	-119.602890	1339.61	9.00	1348.61

Name: WA-221-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.186273	-119.603363	1338.88	9.00	1347.88
2	46.186615	-119.604457	1338.58	9.00	1347.58
3	46.186749	-119.605937	1332.06	9.00	1341.06
4	46.186689	-119.611280	1330.41	9.00	1339.41
5	46.186674	-119.615701	1344.05	9.00	1353.05
6	46.186674	-119.622095	1349.76	9.00	1358.76
7	46.186719	-119.626730	1353.10	9.00	1362.10

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1-1	SA tracking	SA tracking	0	0	-
PV array 1-10	SA tracking	SA tracking	0	0	-
PV array 1-11	SA tracking	SA tracking	0	0	-
PV array 1-12	SA tracking	SA tracking	0	0	-
PV array 1-2	SA tracking	SA tracking	0	0	-
PV array 1-3	SA tracking	SA tracking	0	0	-
PV array 1-4	SA tracking	SA tracking	0	0	-
PV array 1-5	SA tracking	SA tracking	0	0	-
PV array 1-6	SA tracking	SA tracking	0	0	-
PV array 1-7	SA tracking	SA tracking	0	0	-
PV array 1-8	SA tracking	SA tracking	0	0	-
PV array 1-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Results for: PV array 1-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare

0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare

0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 1-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 1-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
Country Well Rd	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
S Travis Road-1	0	0
WA-221-1	0	0
WA-221-2	0	0
WA-221-3	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Route: Country Well Rd

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-3

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven West2-1st Floor**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 21:36 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

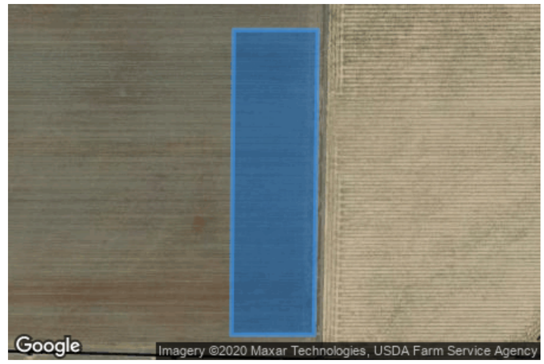
DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46937.8449

PV Array(s)

Name: PV array 2-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.129706	-119.538246	1244.06	7.00	1251.06
2	46.127238	-119.538161	1241.57	7.00	1248.57
3	46.127149	-119.517561	1301.28	7.00	1308.28
4	46.129469	-119.517647	1299.76	7.00	1306.76

Name: PV array 2-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.2°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.138739	-119.520554	1306.61	7.00	1313.61
2	46.138739	-119.517507	1318.60	7.00	1325.60
3	46.131096	-119.517636	1306.18	7.00	1313.18
4	46.131096	-119.520640	1303.84	7.00	1310.84

Name: PV array 2-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.139481	-119.516282	1316.28	7.00	1323.28
2	46.138797	-119.516926	1320.81	7.00	1327.81
3	46.131154	-119.517141	1304.42	7.00	1311.42
4	46.131035	-119.511004	1309.38	7.00	1316.38
5	46.132671	-119.508600	1325.82	7.00	1332.82
6	46.142187	-119.508128	1341.08	7.00	1348.08
7	46.142157	-119.508772	1337.73	7.00	1344.73
8	46.140522	-119.511819	1326.80	7.00	1333.80

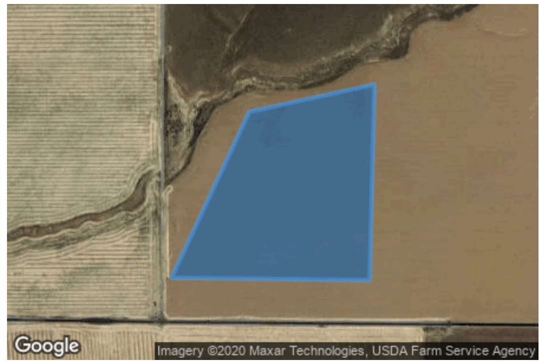
Name: PV array 2-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.132731	-119.508686	1325.82	7.00	1332.82
2	46.132731	-119.504524	1323.39	7.00	1330.39
3	46.134396	-119.503322	1340.92	7.00	1347.92
4	46.142217	-119.503107	1364.22	7.00	1371.22
5	46.142217	-119.508214	1340.93	7.00	1347.93

Name: PV array 2-13
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

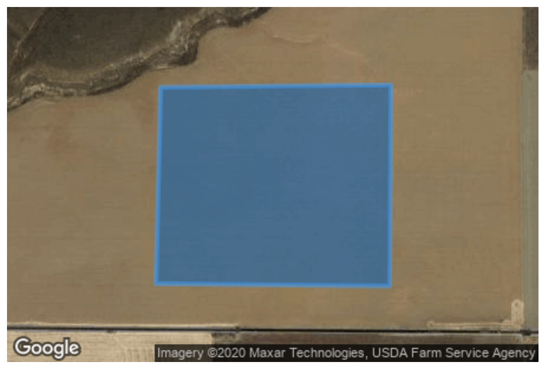
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.134455	-119.503408	1341.36	7.00	1348.36
2	46.133861	-119.500704	1346.09	7.00	1353.09
3	46.133920	-119.497786	1352.12	7.00	1359.12
4	46.135511	-119.496734	1348.19	7.00	1355.19
5	46.137221	-119.496455	1365.53	7.00	1372.53
6	46.142247	-119.496455	1388.24	7.00	1395.24
7	46.142247	-119.503150	1364.24	7.00	1371.24

Name: PV array 2-14
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.55°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



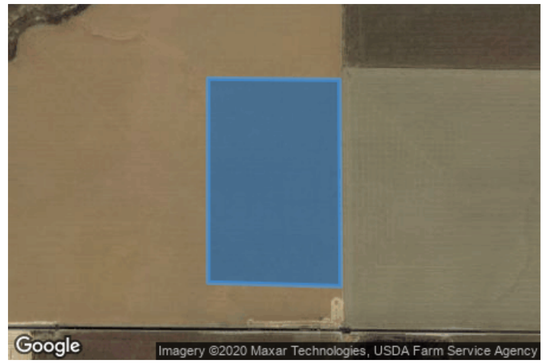
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.131364	-119.495989	1350.79	7.00	1357.79
2	46.131305	-119.488779	1384.33	7.00	1391.33
3	46.136212	-119.488607	1359.75	7.00	1366.75
4	46.135528	-119.493156	1351.98	7.00	1358.98

Name: PV array 2-15
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.09°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



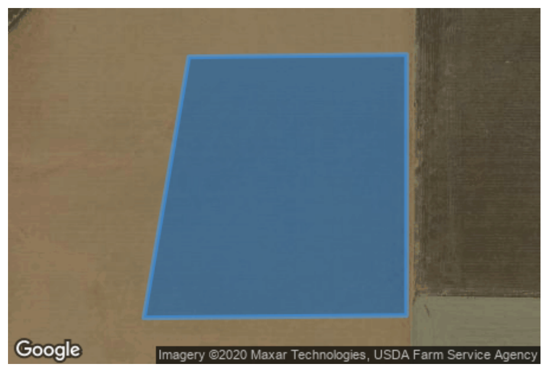
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.131364	-119.488865	1384.99	7.00	1391.99
2	46.131305	-119.480367	1398.89	7.00	1405.89
3	46.136361	-119.480324	1400.78	7.00	1407.78
4	46.136301	-119.488693	1355.83	7.00	1362.83

Name: PV array 2-16
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.2°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



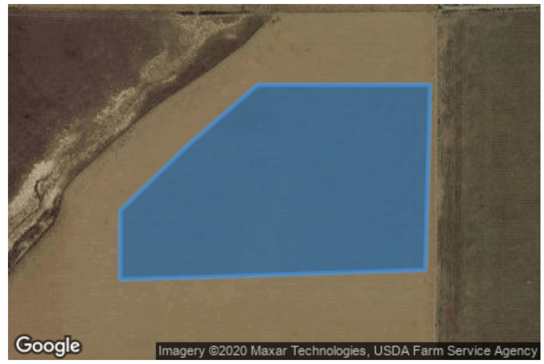
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136450	-119.480410	1399.88	7.00	1406.88
2	46.136420	-119.475647	1421.86	7.00	1428.86
3	46.131245	-119.475604	1413.32	7.00	1420.32
4	46.131335	-119.480410	1399.47	7.00	1406.47

Name: PV array 2-17
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



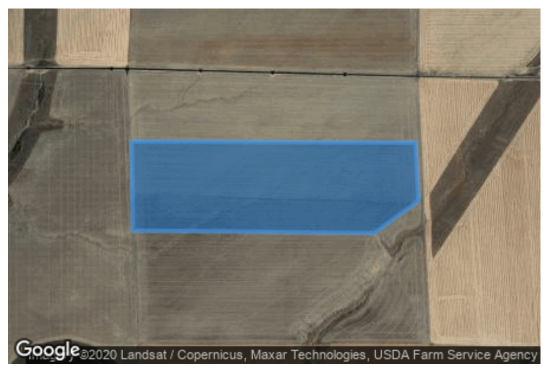
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136479	-119.475690	1420.73	7.00	1427.73
2	46.139751	-119.475690	1433.42	7.00	1440.42
3	46.139721	-119.479638	1411.17	7.00	1418.18
4	46.136450	-119.480453	1399.73	7.00	1406.74

Name: PV array 2-18
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.55°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



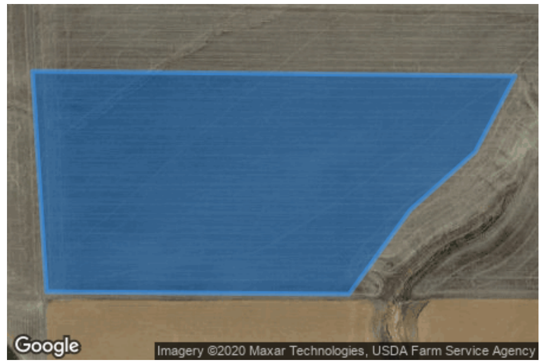
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.139810	-119.475733	1432.94	7.00	1439.94
2	46.142129	-119.475647	1420.18	7.00	1427.18
3	46.142129	-119.478780	1394.02	7.00	1401.02
4	46.141356	-119.480067	1394.82	7.00	1401.82
5	46.140553	-119.481269	1386.66	7.00	1393.66
6	46.139691	-119.481269	1395.40	7.00	1402.40
7	46.139721	-119.479681	1411.13	7.00	1418.13

Name: PV array 2-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.3°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



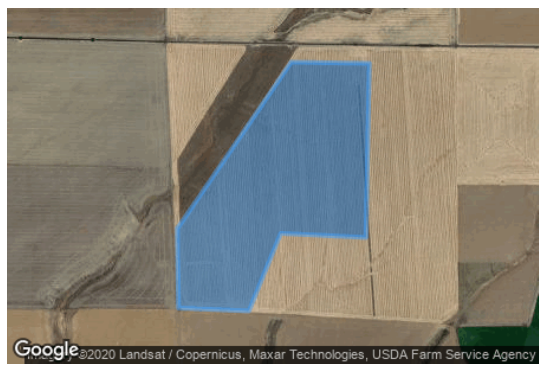
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.127238	-119.538203	1241.38	7.00	1248.38
2	46.122746	-119.538118	1237.40	7.00	1244.40
3	46.122628	-119.520608	1269.48	7.00	1276.49
4	46.124234	-119.517390	1284.60	7.00	1291.60
5	46.127178	-119.517604	1301.23	7.00	1308.23

Name: PV array 2-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.09°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.122776	-119.538203	1237.89	7.00	1244.89
2	46.117243	-119.537689	1220.47	7.00	1227.47
3	46.117184	-119.526702	1246.77	7.00	1253.77
4	46.119296	-119.524471	1256.58	7.00	1263.58
5	46.120754	-119.522110	1266.27	7.00	1273.27
6	46.122657	-119.520651	1269.94	7.00	1276.94

Name: PV array 2-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

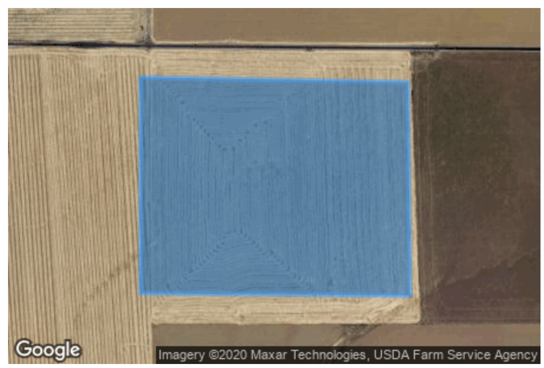


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.121116	-119.516591	1271.22	7.00	1278.22
2	46.117130	-119.516505	1249.39	7.00	1256.39
3	46.116982	-119.511398	1278.19	7.00	1285.19
4	46.120878	-119.509081	1298.03	7.00	1305.03
5	46.120670	-119.502901	1307.13	7.00	1314.13
6	46.129413	-119.502650	1335.25	7.00	1342.25
7	46.129472	-119.508315	1312.03	7.00	1319.03

Name: PV array 2-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

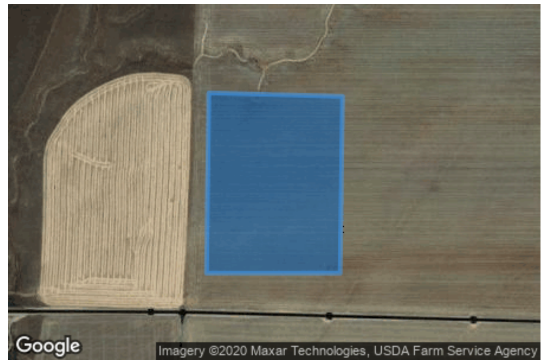
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.120727	-119.503080	1306.81	7.00	1313.81
2	46.117336	-119.502736	1296.43	7.00	1303.43
3	46.117217	-119.497415	1305.85	7.00	1312.85
4	46.117753	-119.496556	1300.34	7.00	1307.34
5	46.129413	-119.496471	1350.77	7.00	1357.77
6	46.129413	-119.502908	1334.48	7.00	1341.48

Name: PV array 2-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



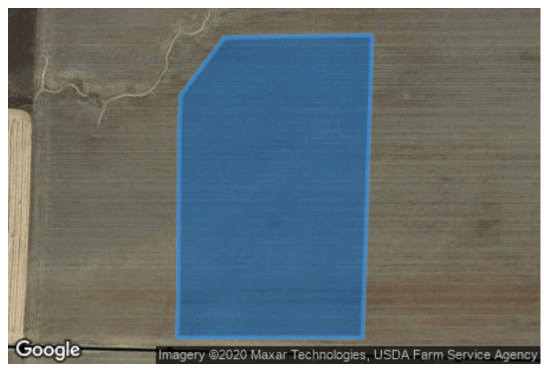
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.129472	-119.496642	1351.12	7.00	1358.12
2	46.129353	-119.486943	1375.32	7.00	1382.32
3	46.123999	-119.486858	1342.30	7.00	1349.30
4	46.124059	-119.496642	1338.21	7.00	1345.21

Name: PV array 2-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.43°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



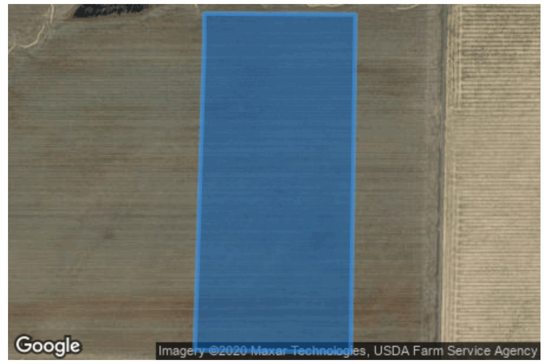
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136360	-119.537548	1251.82	7.00	1258.82
2	46.136271	-119.532699	1273.84	7.00	1280.84
3	46.131840	-119.532785	1267.48	7.00	1274.48
4	46.131840	-119.537634	1248.75	7.00	1255.75

Name: PV array 2-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.14°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136360	-119.532828	1271.34	7.00	1278.34
2	46.137163	-119.532785	1264.52	7.00	1271.52
3	46.138620	-119.531197	1272.00	7.00	1279.00
4	46.138679	-119.525833	1297.72	7.00	1304.72
5	46.131096	-119.526176	1288.04	7.00	1295.04
6	46.131096	-119.532914	1265.63	7.00	1272.63
7	46.131929	-119.532871	1267.81	7.00	1274.81

Name: PV array 2-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.14°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.138739	-119.525918	1297.22	7.00	1304.22
2	46.139542	-119.525918	1290.88	7.00	1297.88
3	46.139512	-119.520425	1302.20	7.00	1309.20
4	46.131037	-119.520597	1303.84	7.00	1310.84
5	46.131096	-119.526262	1287.91	7.00	1294.91

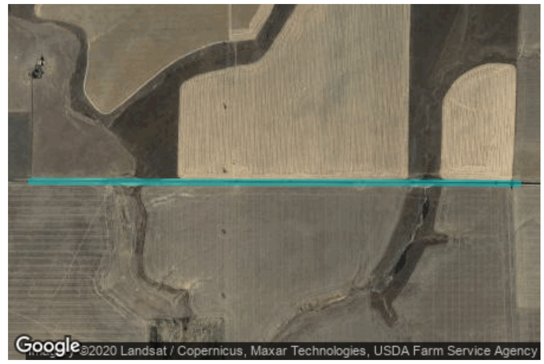
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.142763	-119.459696	1493.13	6.00
OP 2	2	46.157483	-119.496755	1415.78	6.00
OP 3	3	46.136308	-119.572725	1188.75	6.00
OP 4	4	46.061492	-119.561396	992.85	6.00
OP 5	5	46.129143	-119.360406	1793.71	6.00

Route Receptor(s)

Name: Sellards Road 1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130963	-119.573374	1183.15	5.00	1188.15
2	46.130919	-119.562151	1181.49	5.00	1186.49
3	46.130904	-119.554555	1215.70	5.00	1220.70
4	46.130889	-119.542899	1221.76	5.00	1226.76
5	46.130844	-119.538050	1246.26	5.00	1251.26

Name: Sellards Road 2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130844	-119.537878	1247.08	5.00	1252.09
2	46.130696	-119.530857	1270.87	5.00	1275.87
3	46.130547	-119.521759	1298.29	5.00	1303.29
4	46.130443	-119.515729	1303.92	5.00	1308.92
5	46.130370	-119.508138	1302.79	5.00	1307.79
6	46.130281	-119.499812	1345.74	5.00	1350.74
7	46.130221	-119.492731	1360.96	5.00	1365.96
8	46.130177	-119.483955	1386.73	5.00	1391.73
9	46.130117	-119.475694	1406.43	5.00	1411.43

Name: Sellards Road 3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130132	-119.474878	1407.37	5.00	1412.37
2	46.130058	-119.463634	1421.43	5.00	1426.43
3	46.129998	-119.456566	1422.72	5.00	1427.72
4	46.129894	-119.448626	1479.50	5.00	1484.50
5	46.129835	-119.443391	1507.31	5.00	1512.31
6	46.129760	-119.437039	1525.78	5.00	1530.78

Name: S Travis Road-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.158019	-119.454002	1504.91	5.00	1509.91
2	46.155270	-119.454195	1512.40	5.00	1517.40
3	46.151152	-119.454667	1487.89	5.00	1492.89
4	46.147584	-119.454753	1498.02	5.00	1503.02
5	46.142991	-119.454688	1492.24	5.00	1497.24
6	46.136984	-119.454495	1455.52	5.00	1460.52
7	46.131308	-119.454323	1437.90	5.00	1442.90

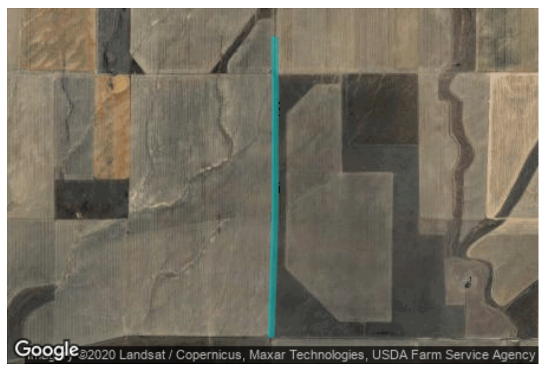
Name: S Travis Road-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.100269	-119.453967	1399.71	5.00	1404.71
2	46.103423	-119.453945	1413.05	5.00	1418.05
3	46.106785	-119.453924	1429.66	5.00	1434.66
4	46.109404	-119.453902	1409.11	5.00	1414.11
5	46.114542	-119.453881	1361.62	5.00	1366.62
6	46.117770	-119.453902	1409.03	5.00	1414.03

Name: WA-221-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.161044	-119.601121	1218.99	5.00	1223.99
2	46.155946	-119.600993	1197.87	5.00	1202.87
3	46.150446	-119.601057	1172.58	5.00	1177.58
4	46.145035	-119.601014	1147.99	5.00	1152.99
5	46.139043	-119.601229	1127.91	5.00	1132.91
6	46.135178	-119.601422	1111.14	5.00	1116.14
7	46.131490	-119.601594	1098.20	5.00	1103.20

Name: WA-221-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.096573	-119.601872	1001.79	5.00	1006.79
2	46.101126	-119.601786	1015.06	5.00	1020.06
3	46.105717	-119.601851	1023.67	5.00	1028.67
4	46.108826	-119.601808	1030.84	5.00	1035.84
5	46.112188	-119.601829	1049.84	5.00	1054.84
6	46.116725	-119.601765	1063.69	5.00	1068.69
7	46.122005	-119.601679	1081.37	5.00	1086.37
8	46.124890	-119.601679	1087.24	5.00	1092.24

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 2-1	SA tracking	SA tracking	0	0	-
PV array 2-10	SA tracking	SA tracking	0	0	-
PV array 2-11	SA tracking	SA tracking	0	0	-
PV array 2-12	SA tracking	SA tracking	0	0	-
PV array 2-13	SA tracking	SA tracking	0	0	-
PV array 2-14	SA tracking	SA tracking	0	0	-
PV array 2-15	SA tracking	SA tracking	0	0	-
PV array 2-16	SA tracking	SA tracking	0	0	-
PV array 2-17	SA tracking	SA tracking	0	0	-
PV array 2-18	SA tracking	SA tracking	0	0	-
PV array 2-2	SA tracking	SA tracking	0	0	-
PV array 2-3	SA tracking	SA tracking	0	0	-
PV array 2-4	SA tracking	SA tracking	0	0	-
PV array 2-5	SA tracking	SA tracking	0	0	-
PV array 2-6	SA tracking	SA tracking	0	0	-
PV array 2-7	SA tracking	SA tracking	0	0	-
PV array 2-8	SA tracking	SA tracking	0	0	-
PV array 2-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Results for: PV array 2-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-13

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-14

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-15

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-16

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-17

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-18

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven West2-2nd floor**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 21:37 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

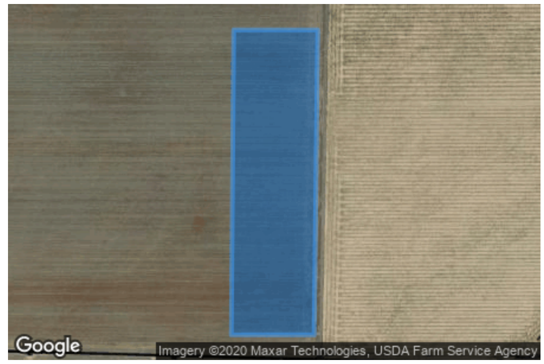
DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46890.8449

PV Array(s)

Name: PV array 2-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.129706	-119.538246	1244.06	7.00	1251.06
2	46.127238	-119.538161	1241.57	7.00	1248.57
3	46.127149	-119.517561	1301.28	7.00	1308.28
4	46.129469	-119.517647	1299.76	7.00	1306.76

Name: PV array 2-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.2°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

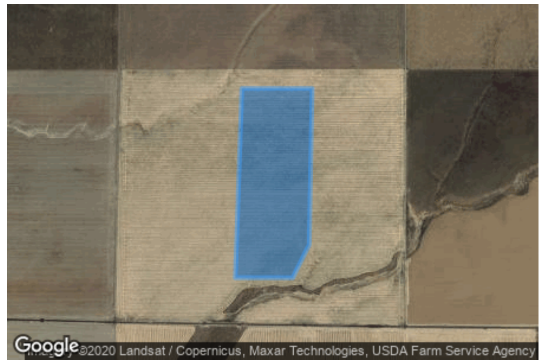


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.138739	-119.520554	1306.61	7.00	1313.61
2	46.138739	-119.517507	1318.60	7.00	1325.60
3	46.131096	-119.517636	1306.18	7.00	1313.18
4	46.131096	-119.520640	1303.84	7.00	1310.84

Name: PV array 2-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.139481	-119.516282	1316.28	7.00	1323.28
2	46.138797	-119.516926	1320.81	7.00	1327.81
3	46.131154	-119.517141	1304.42	7.00	1311.42
4	46.131035	-119.511004	1309.38	7.00	1316.38
5	46.132671	-119.508600	1325.82	7.00	1332.82
6	46.142187	-119.508128	1341.08	7.00	1348.08
7	46.142157	-119.508772	1337.73	7.00	1344.73
8	46.140522	-119.511819	1326.80	7.00	1333.80

Name: PV array 2-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

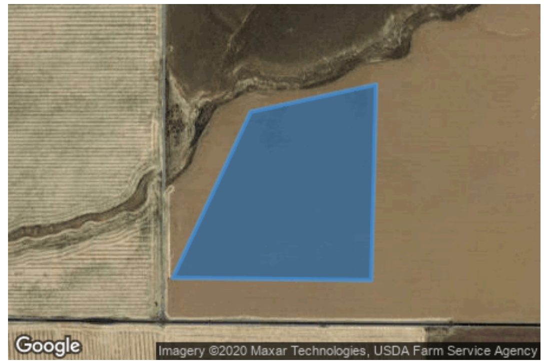


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.132731	-119.508686	1325.82	7.00	1332.82
2	46.132731	-119.504524	1323.39	7.00	1330.39
3	46.134396	-119.503322	1340.92	7.00	1347.92
4	46.142217	-119.503107	1364.22	7.00	1371.22
5	46.142217	-119.508214	1340.93	7.00	1347.93

Name: PV array 2-13
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.75°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

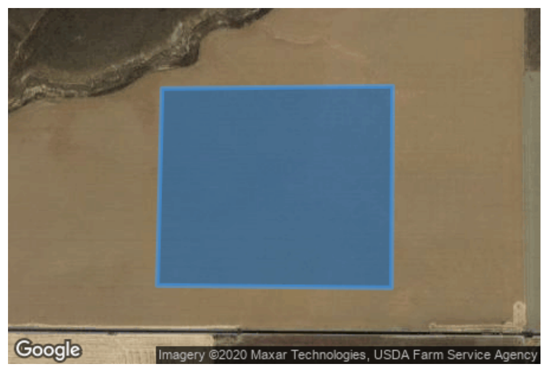
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.134455	-119.503408	1341.36	7.00	1348.36
2	46.133861	-119.500704	1346.09	7.00	1353.09
3	46.133920	-119.497786	1352.12	7.00	1359.12
4	46.135511	-119.496734	1348.19	7.00	1355.19
5	46.137221	-119.496455	1365.53	7.00	1372.53
6	46.142247	-119.496455	1388.24	7.00	1395.24
7	46.142247	-119.503150	1364.24	7.00	1371.24

Name: PV array 2-14
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.55°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



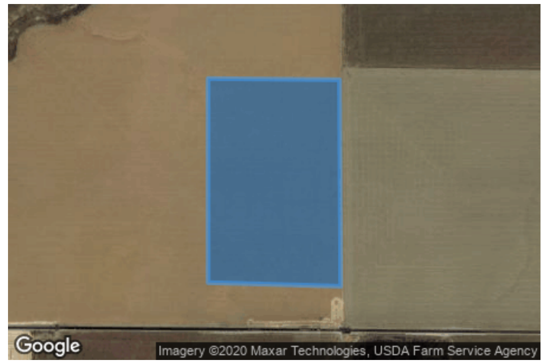
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.131364	-119.495989	1350.79	7.00	1357.79
2	46.131305	-119.488779	1384.33	7.00	1391.33
3	46.136212	-119.488607	1359.75	7.00	1366.75
4	46.135528	-119.493156	1351.98	7.00	1358.98

Name: PV array 2-15
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.09°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



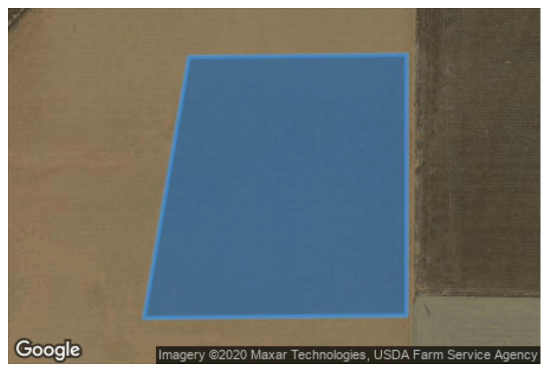
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.131364	-119.488865	1384.99	7.00	1391.99
2	46.131305	-119.480367	1398.89	7.00	1405.89
3	46.136361	-119.480324	1400.78	7.00	1407.78
4	46.136301	-119.488693	1355.83	7.00	1362.83

Name: PV array 2-16
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.2°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



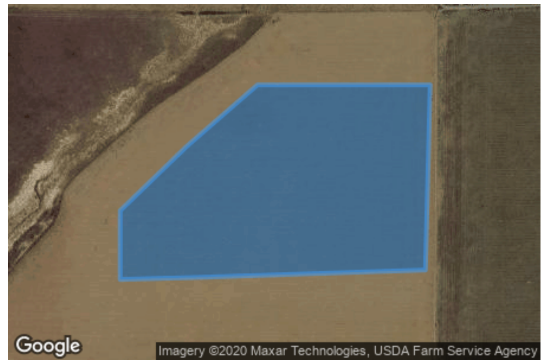
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136450	-119.480410	1399.88	7.00	1406.88
2	46.136420	-119.475647	1421.86	7.00	1428.86
3	46.131245	-119.475604	1413.32	7.00	1420.32
4	46.131335	-119.480410	1399.47	7.00	1406.47

Name: PV array 2-17
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



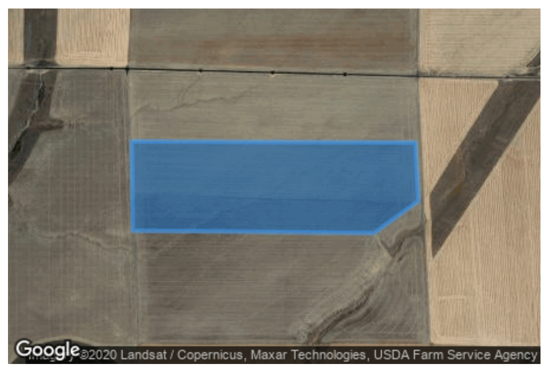
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136479	-119.475690	1420.73	7.00	1427.73
2	46.139751	-119.475690	1433.42	7.00	1440.42
3	46.139721	-119.479638	1411.17	7.00	1418.18
4	46.136450	-119.480453	1399.73	7.00	1406.74

Name: PV array 2-18
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.55°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



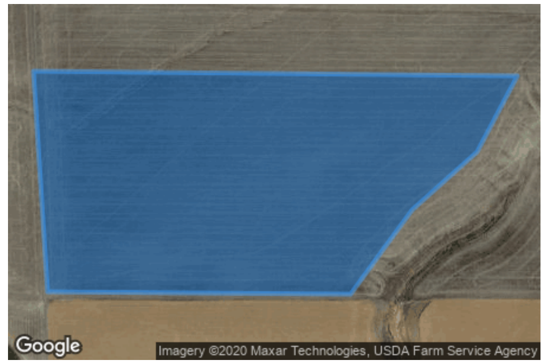
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.139810	-119.475733	1432.94	7.00	1439.94
2	46.142129	-119.475647	1420.18	7.00	1427.18
3	46.142129	-119.478780	1394.02	7.00	1401.02
4	46.141356	-119.480067	1394.82	7.00	1401.82
5	46.140553	-119.481269	1386.66	7.00	1393.66
6	46.139691	-119.481269	1395.40	7.00	1402.40
7	46.139721	-119.479681	1411.13	7.00	1418.13

Name: PV array 2-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.3°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



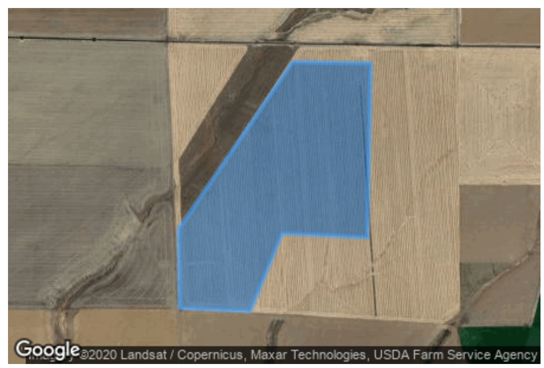
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.127238	-119.538203	1241.38	7.00	1248.38
2	46.122746	-119.538118	1237.40	7.00	1244.40
3	46.122628	-119.520608	1269.48	7.00	1276.49
4	46.124234	-119.517390	1284.60	7.00	1291.60
5	46.127178	-119.517604	1301.23	7.00	1308.23

Name: PV array 2-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.09°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.122776	-119.538203	1237.89	7.00	1244.89
2	46.117243	-119.537689	1220.47	7.00	1227.47
3	46.117184	-119.526702	1246.77	7.00	1253.77
4	46.119296	-119.524471	1256.58	7.00	1263.58
5	46.120754	-119.522110	1266.27	7.00	1273.27
6	46.122657	-119.520651	1269.94	7.00	1276.94

Name: PV array 2-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

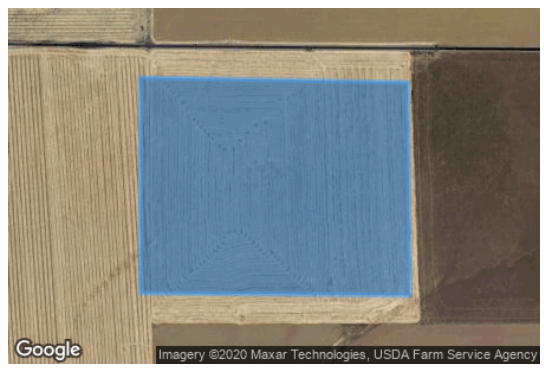


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.121116	-119.516591	1271.22	7.00	1278.22
2	46.117130	-119.516505	1249.39	7.00	1256.39
3	46.116982	-119.511398	1278.19	7.00	1285.19
4	46.120878	-119.509081	1298.03	7.00	1305.03
5	46.120670	-119.502901	1307.13	7.00	1314.13
6	46.129413	-119.502650	1335.25	7.00	1342.25
7	46.129472	-119.508315	1312.03	7.00	1319.03

Name: PV array 2-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

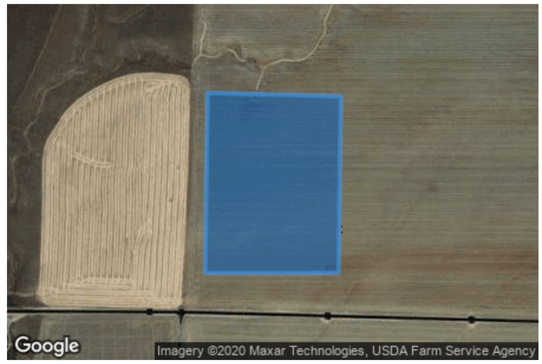
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.120727	-119.503080	1306.81	7.00	1313.81
2	46.117336	-119.502736	1296.43	7.00	1303.43
3	46.117217	-119.497415	1305.85	7.00	1312.85
4	46.117753	-119.496556	1300.34	7.00	1307.34
5	46.129413	-119.496471	1350.77	7.00	1357.77
6	46.129413	-119.502908	1334.48	7.00	1341.48

Name: PV array 2-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



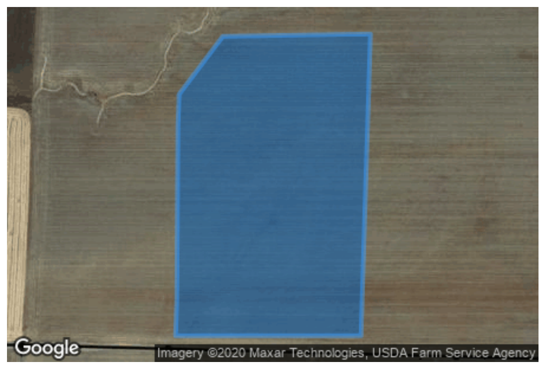
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.129472	-119.496642	1351.12	7.00	1358.12
2	46.129353	-119.486943	1375.32	7.00	1382.32
3	46.123999	-119.486858	1342.30	7.00	1349.30
4	46.124059	-119.496642	1338.21	7.00	1345.21

Name: PV array 2-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.43°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



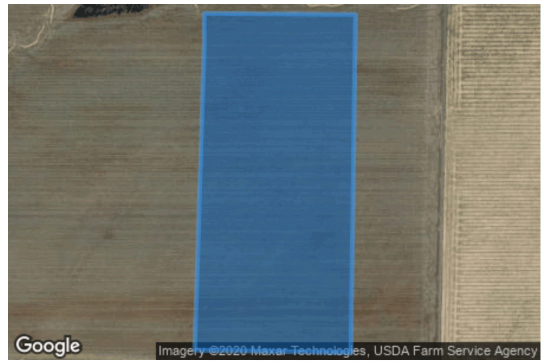
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136360	-119.537548	1251.82	7.00	1258.82
2	46.136271	-119.532699	1273.84	7.00	1280.84
3	46.131840	-119.532785	1267.48	7.00	1274.48
4	46.131840	-119.537634	1248.75	7.00	1255.75

Name: PV array 2-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.14°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.136360	-119.532828	1271.34	7.00	1278.34
2	46.137163	-119.532785	1264.52	7.00	1271.52
3	46.138620	-119.531197	1272.00	7.00	1279.00
4	46.138679	-119.525833	1297.72	7.00	1304.72
5	46.131096	-119.526176	1288.04	7.00	1295.04
6	46.131096	-119.532914	1265.63	7.00	1272.63
7	46.131929	-119.532871	1267.81	7.00	1274.81

Name: PV array 2-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.14°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.138739	-119.525918	1297.22	7.00	1304.22
2	46.139542	-119.525918	1290.88	7.00	1297.88
3	46.139512	-119.520425	1302.20	7.00	1309.20
4	46.131037	-119.520597	1303.84	7.00	1310.84
5	46.131096	-119.526262	1287.91	7.00	1294.91

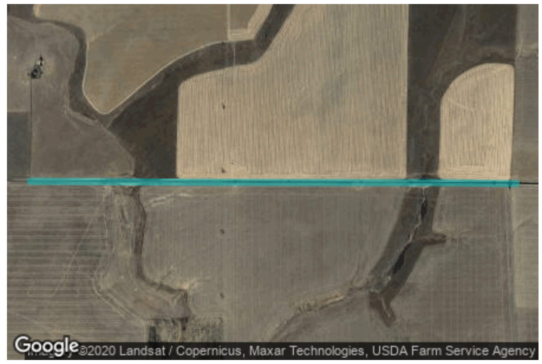
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.142763	-119.459696	1493.13	16.00
OP 2	2	46.157483	-119.496755	1415.78	16.00
OP 3	3	46.136308	-119.572725	1188.75	16.00
OP 4	4	46.061492	-119.561396	992.85	16.00
OP 5	5	46.129147	-119.360395	1793.60	16.00

Route Receptor(s)

Name: Sellards Road 1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130963	-119.573374	1183.15	9.00	1192.15
2	46.130919	-119.562151	1181.49	9.00	1190.49
3	46.130904	-119.554555	1215.70	9.00	1224.70
4	46.130889	-119.542899	1221.76	9.00	1230.76
5	46.130844	-119.538050	1246.26	9.00	1255.26

Name: Sellards Road 2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130844	-119.537878	1247.08	9.00	1256.09
2	46.130696	-119.530857	1270.87	9.00	1279.87
3	46.130547	-119.521759	1298.29	9.00	1307.29
4	46.130443	-119.515729	1303.92	9.00	1312.92
5	46.130370	-119.508138	1302.79	9.00	1311.79
6	46.130281	-119.499812	1345.74	9.00	1354.74
7	46.130221	-119.492731	1360.96	9.00	1369.96
8	46.130177	-119.483955	1386.73	9.00	1395.73
9	46.130117	-119.475694	1406.43	9.00	1415.43

Name: Sellards Road 3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.130132	-119.474878	1407.37	9.00	1416.37
2	46.130058	-119.463634	1421.43	9.00	1430.43
3	46.129998	-119.456566	1422.72	9.00	1431.72
4	46.129894	-119.448626	1479.50	9.00	1488.50
5	46.129835	-119.443391	1507.31	9.00	1516.31
6	46.129760	-119.437039	1525.78	9.00	1534.78

Name: S Travis Road-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.158019	-119.454002	1504.91	9.00	1513.91
2	46.155270	-119.454195	1512.40	9.00	1521.40
3	46.151152	-119.454667	1487.89	9.00	1496.89
4	46.147584	-119.454753	1498.02	9.00	1507.02
5	46.142991	-119.454688	1492.24	9.00	1501.24
6	46.136984	-119.454495	1455.52	9.00	1464.52
7	46.131308	-119.454323	1437.90	9.00	1446.90

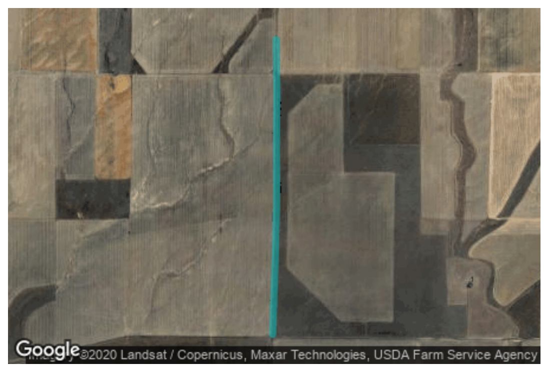
Name: S Travis Road-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.100269	-119.453967	1399.71	9.00	1408.71
2	46.103423	-119.453945	1413.05	9.00	1422.05
3	46.106785	-119.453924	1429.66	9.00	1438.67
4	46.109404	-119.453902	1409.11	9.00	1418.11
5	46.114542	-119.453881	1361.62	9.00	1370.62
6	46.117770	-119.453902	1409.03	9.00	1418.03

Name: WA-221-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.161044	-119.601121	1218.99	9.00	1227.99
2	46.155946	-119.600993	1197.87	9.00	1206.87
3	46.150446	-119.601057	1172.58	9.00	1181.58
4	46.145035	-119.601014	1147.99	9.00	1156.99
5	46.139043	-119.601229	1127.91	9.00	1136.91
6	46.135178	-119.601422	1111.14	9.00	1120.14
7	46.131490	-119.601594	1098.20	9.00	1107.20

Name: WA-221-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.096573	-119.601872	1001.79	9.00	1010.79
2	46.101126	-119.601786	1015.06	9.00	1024.06
3	46.105717	-119.601851	1023.67	9.00	1032.67
4	46.108826	-119.601808	1030.84	9.00	1039.84
5	46.112188	-119.601829	1049.84	9.00	1058.84
6	46.116725	-119.601765	1063.69	9.00	1072.69
7	46.122005	-119.601679	1081.37	9.00	1090.37
8	46.124890	-119.601679	1087.24	9.00	1096.24

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 2-1	SA tracking	SA tracking	0	0	-
PV array 2-10	SA tracking	SA tracking	0	0	-
PV array 2-11	SA tracking	SA tracking	0	0	-
PV array 2-12	SA tracking	SA tracking	0	0	-
PV array 2-13	SA tracking	SA tracking	0	0	-
PV array 2-14	SA tracking	SA tracking	0	0	-
PV array 2-15	SA tracking	SA tracking	0	0	-
PV array 2-16	SA tracking	SA tracking	0	0	-
PV array 2-17	SA tracking	SA tracking	0	0	-
PV array 2-18	SA tracking	SA tracking	0	0	-
PV array 2-2	SA tracking	SA tracking	0	0	-
PV array 2-3	SA tracking	SA tracking	0	0	-
PV array 2-4	SA tracking	SA tracking	0	0	-
PV array 2-5	SA tracking	SA tracking	0	0	-
PV array 2-6	SA tracking	SA tracking	0	0	-
PV array 2-7	SA tracking	SA tracking	0	0	-
PV array 2-8	SA tracking	SA tracking	0	0	-
PV array 2-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Results for: PV array 2-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-13

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-14

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-15

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-16

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-17

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-18

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 2-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
Sellards Road 1	0	0
Sellards Road 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Sellards Road 3	0	0
S Travis Road-1	0	0
S Travis Road-2	0	0
WA-221-1	0	0
WA-221-2	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 1

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 2

0 minutes of yellow glare
0 minutes of green glare

Route: Sellards Road 3

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-1

0 minutes of yellow glare
0 minutes of green glare

Route: S Travis Road-2

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-1

0 minutes of yellow glare
0 minutes of green glare

Route: WA-221-2

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**

Site configuration: **Horse Heaven East1-1st floor**

Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 04:09 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46953.8449

PV Array(s)

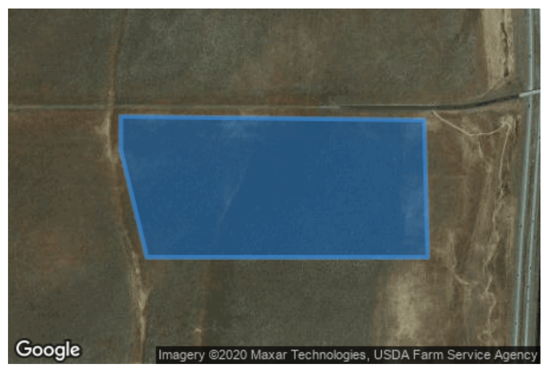
Name: PV array 3-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.069382	-119.264454	1544.06	7.00	1551.06
2	46.069263	-119.255786	1496.36	7.00	1503.36
3	46.067030	-119.254841	1465.97	7.00	1472.97
4	46.065094	-119.254863	1458.20	7.00	1465.20
5	46.062504	-119.256944	1443.28	7.00	1450.28
6	46.062712	-119.264755	1455.44	7.00	1462.44
7	46.069397	-119.264733	1546.85	7.00	1553.85

Name: PV array 3-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

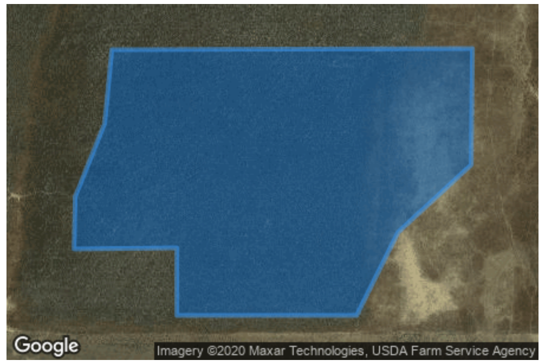
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061648	-119.244412	1444.08	7.00	1451.08
2	46.061693	-119.239627	1424.05	7.00	1431.05
3	46.058998	-119.239391	1389.17	7.00	1396.17
4	46.058298	-119.239091	1378.12	7.00	1385.12
5	46.055737	-119.239091	1342.19	7.00	1349.19
6	46.055796	-119.244648	1362.40	7.00	1369.40
7	46.058476	-119.244627	1394.29	7.00	1401.29

Name: PV array 3-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061901	-119.238576	1428.54	7.00	1435.54
2	46.061052	-119.238576	1409.07	7.00	1416.07
3	46.058357	-119.237632	1369.29	7.00	1376.29
4	46.058357	-119.227439	1362.09	7.00	1369.09
5	46.061812	-119.227568	1414.75	7.00	1421.75

Name: PV array 3-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

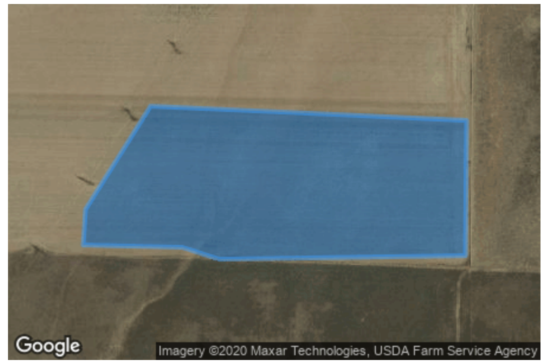


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.058357	-119.234005	1375.86	7.00	1382.86
2	46.057434	-119.234134	1368.01	7.00	1375.01
3	46.056511	-119.234670	1355.03	7.00	1362.03
4	46.055856	-119.234692	1350.69	7.00	1357.69
5	46.055871	-119.232825	1362.74	7.00	1369.74
6	46.055022	-119.232825	1354.50	7.00	1361.50
7	46.055022	-119.229563	1346.52	7.00	1353.52
8	46.056064	-119.228812	1354.02	7.00	1361.02
9	46.056913	-119.227482	1351.79	7.00	1358.79
10	46.058372	-119.227461	1362.76	7.00	1369.76

Name: PV array 3-13
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.9°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

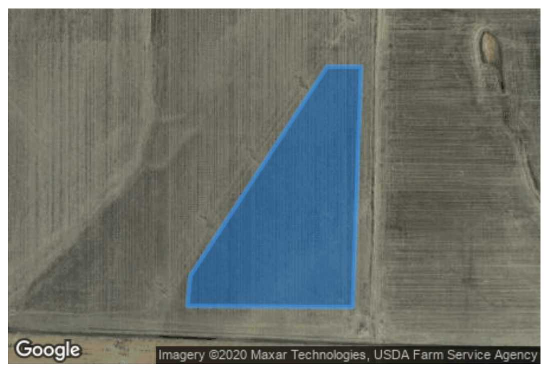
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060736	-119.221786	1390.15	7.00	1397.15
2	46.060706	-119.217752	1410.38	7.00	1417.38
3	46.061689	-119.217752	1398.79	7.00	1405.79
4	46.061600	-119.214233	1427.63	7.00	1434.63
5	46.060796	-119.214276	1420.95	7.00	1427.95
6	46.054750	-119.219898	1338.12	7.00	1345.13
7	46.054810	-119.222902	1329.50	7.00	1336.50
8	46.058026	-119.222816	1365.76	7.00	1372.76

Name: PV array 3-14
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.058324	-119.215134	1376.23	7.00	1383.23
2	46.057967	-119.203676	1398.27	7.00	1405.27
3	46.054572	-119.203719	1365.49	7.00	1372.49
4	46.054482	-119.212645	1352.42	7.00	1359.42
5	46.054780	-119.213975	1350.65	7.00	1357.65
6	46.054840	-119.217580	1329.72	7.00	1336.72
7	46.055733	-119.217494	1344.77	7.00	1351.77

Name: PV array 3-15
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.062523	-119.204276	1453.41	7.00	1460.41
2	46.068567	-119.203976	1534.61	7.00	1541.61
3	46.068567	-119.205221	1533.03	7.00	1540.03
4	46.063312	-119.210177	1461.61	7.00	1468.61
5	46.062553	-119.210285	1458.01	7.00	1465.01

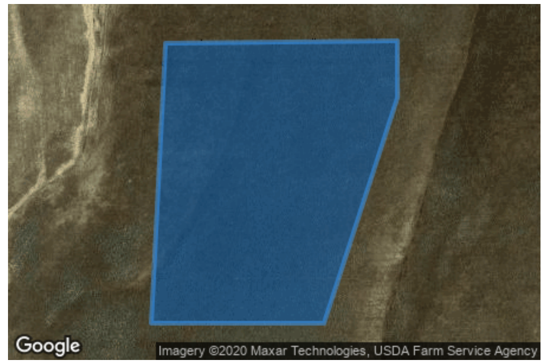
Name: PV array 3-16
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.067962	-119.203168	1531.20	7.00	1538.20
2	46.067917	-119.200550	1490.05	7.00	1497.05
3	46.067158	-119.199949	1481.33	7.00	1488.33
4	46.063763	-119.197975	1435.30	7.00	1442.30
5	46.062006	-119.197954	1429.33	7.00	1436.33
6	46.062036	-119.203254	1451.51	7.00	1458.51

Name: PV array 3-17
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.23°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

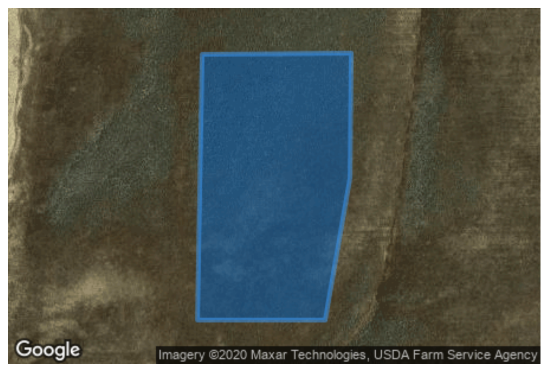
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061167	-119.203211	1444.79	7.00	1451.79
2	46.061137	-119.199370	1437.31	7.00	1444.31
3	46.058606	-119.197138	1390.82	7.00	1397.82
4	46.056774	-119.195700	1356.80	7.00	1363.80
5	46.054407	-119.195679	1346.44	7.00	1353.44
6	46.054451	-119.203318	1363.90	7.00	1370.90

Name: PV array 3-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



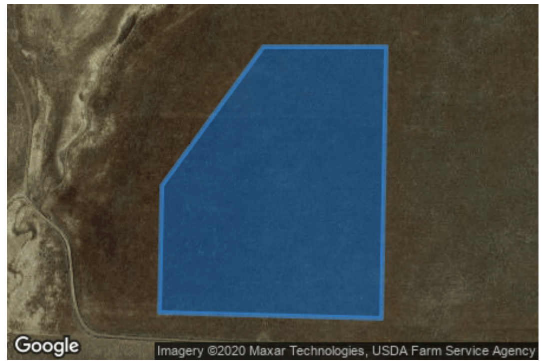
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.076111	-119.243769	1553.84	7.00	1560.84
2	46.076140	-119.239563	1570.47	7.00	1577.47
3	46.075426	-119.239563	1564.52	7.00	1571.52
4	46.072598	-119.240893	1541.36	7.00	1548.36
5	46.072598	-119.244026	1506.08	7.00	1513.08

Name: PV array 3-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



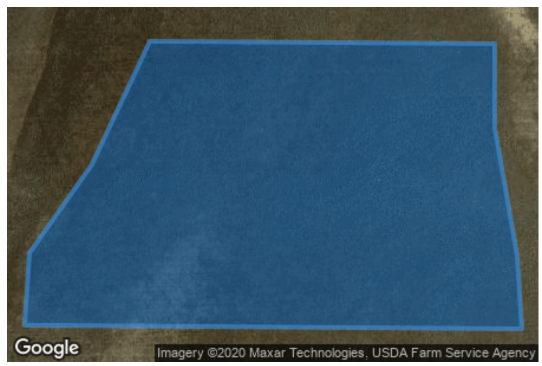
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.071824	-119.243812	1515.23	7.00	1522.23
2	46.071838	-119.241108	1533.04	7.00	1540.04
3	46.070275	-119.241129	1511.95	7.00	1518.95
4	46.068489	-119.241580	1481.38	7.00	1488.38
5	46.068489	-119.243898	1477.93	7.00	1484.93

Name: PV array 3-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.065943	-119.246923	1442.79	7.00	1449.79
2	46.065943	-119.244691	1470.32	7.00	1477.32
3	46.062534	-119.244777	1457.64	7.00	1464.64
4	46.062608	-119.248811	1423.57	7.00	1430.57
5	46.064201	-119.248768	1412.68	7.00	1419.68

Name: PV array 3-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.12°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

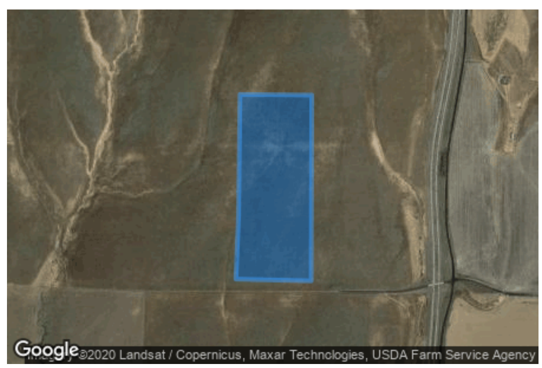


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.076141	-119.236412	1597.99	7.00	1604.99
2	46.076111	-119.230146	1594.28	7.00	1601.28
3	46.075054	-119.230146	1579.54	7.00	1586.54
4	46.073447	-119.229738	1547.68	7.00	1554.69
5	46.072524	-119.229653	1535.47	7.00	1542.47
6	46.072569	-119.238686	1542.55	7.00	1549.55
7	46.073477	-119.238600	1545.59	7.00	1552.59
8	46.074593	-119.237463	1574.18	7.00	1581.18

Name: PV array 3-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.065952	-119.237925	1463.27	7.00	1470.27
2	46.072056	-119.237774	1553.44	7.00	1560.45
3	46.072026	-119.239298	1527.90	7.00	1534.90
4	46.069421	-119.240028	1499.29	7.00	1506.29
5	46.068587	-119.240650	1480.07	7.00	1487.07
6	46.067605	-119.241916	1472.01	7.00	1479.01
7	46.067024	-119.243954	1460.39	7.00	1467.39
8	46.062796	-119.244190	1466.14	7.00	1473.14
9	46.062766	-119.239234	1436.41	7.00	1443.41
10	46.064374	-119.238729	1449.26	7.00	1456.26

Name: PV array 3-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

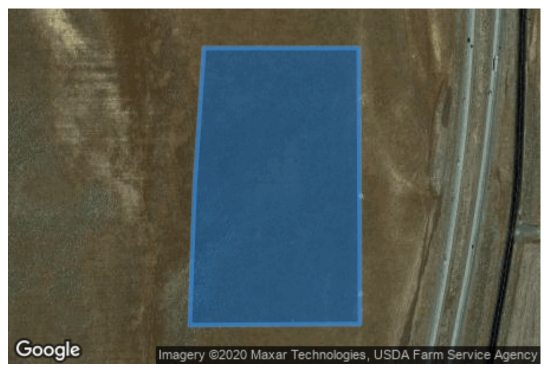


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.072075	-119.237810	1553.56	7.00	1560.57
2	46.072045	-119.232596	1553.16	7.00	1560.16
3	46.062681	-119.232639	1413.33	7.00	1420.33
4	46.062770	-119.238111	1441.44	7.00	1448.44
5	46.065971	-119.237917	1463.55	7.00	1470.55

Name: PV array 3-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.072071	-119.232642	1553.37	7.00	1560.37
2	46.072041	-119.229144	1520.15	7.00	1527.15
3	46.068468	-119.227900	1477.31	7.00	1484.31
4	46.066339	-119.226376	1445.67	7.00	1452.67
5	46.064642	-119.226333	1437.59	7.00	1444.59
6	46.062736	-119.227342	1420.78	7.00	1427.78
7	46.062707	-119.232663	1413.56	7.00	1420.56

Name: PV array 3-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.076121	-119.227108	1576.89	7.00	1583.89
2	46.076121	-119.224297	1556.62	7.00	1563.63
3	46.072653	-119.224276	1509.97	7.00	1516.97
4	46.072638	-119.227366	1523.47	7.00	1530.47
5	46.074350	-119.227280	1544.55	7.00	1551.55

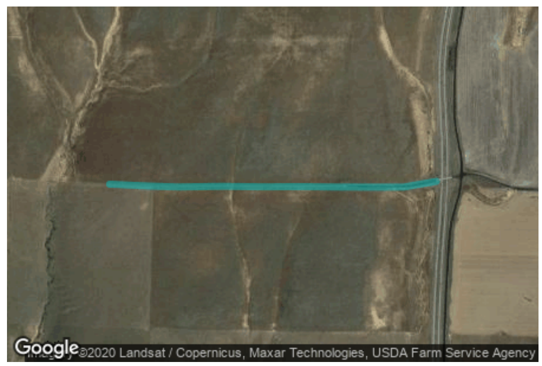
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.072705	-119.218667	1497.61	6.00
OP 2	2	46.125919	-119.219932	1320.29	6.00
OP 3	3	46.077101	-119.145764	1804.81	6.00
OP 4	4	46.065913	-119.078615	1520.73	6.00
OP 5	5	46.017217	-119.129341	1560.78	6.00
OP 6	6	46.100638	-119.351684	1835.32	6.00

Route Receptor(s)

Name: Beck Rd-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.062247	-119.247896	1437.68	5.00	1442.68
2	46.062165	-119.245439	1451.19	5.00	1456.19
3	46.062105	-119.242972	1440.64	5.00	1445.64
4	46.062143	-119.239603	1430.92	5.00	1435.92
5	46.062113	-119.236824	1424.17	5.00	1429.17
6	46.062128	-119.234152	1412.82	5.00	1417.82
7	46.062105	-119.231588	1420.12	5.00	1425.12
8	46.062098	-119.228252	1423.29	5.00	1428.29
9	46.062098	-119.226556	1405.15	5.00	1410.15
10	46.062388	-119.224142	1375.78	5.00	1380.78

Name: Beck Rd-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061852	-119.214432	1427.46	5.00	1432.46
2	46.061785	-119.211922	1443.52	5.00	1448.52
3	46.061696	-119.208124	1462.60	5.00	1467.60
4	46.061622	-119.205484	1447.52	5.00	1452.52
5	46.061547	-119.202823	1447.47	5.00	1452.47
6	46.061510	-119.199894	1440.39	5.00	1445.39
7	46.061480	-119.197910	1421.95	5.00	1426.95
8	46.061383	-119.197062	1392.62	5.00	1397.62

Name: Beck Rd-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061341	-119.187536	1433.77	5.00	1438.77
2	46.061267	-119.183567	1418.60	5.00	1423.60
3	46.061163	-119.178975	1433.57	5.00	1438.57
4	46.061088	-119.176786	1435.14	5.00	1440.14
5	46.060939	-119.173460	1462.67	5.00	1467.67
6	46.060805	-119.167988	1367.84	5.00	1372.84

Name: US HWY 395-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	45.995519	-119.278077	796.24	5.00	801.24
2	45.996115	-119.275952	803.46	5.00	808.46
3	45.996950	-119.273013	808.72	5.00	813.72
4	45.997457	-119.271038	813.88	5.00	818.88
5	45.997964	-119.268356	815.97	5.00	820.97
6	45.998321	-119.265288	814.61	5.00	819.61
7	45.998634	-119.263206	823.31	5.00	828.31
8	45.998947	-119.261683	823.78	5.00	828.78

Name: US HWY 395-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.037771	-119.224776	1159.99	5.00	1164.99
2	46.040459	-119.224690	1191.05	5.00	1196.05
3	46.042857	-119.224615	1214.84	5.00	1219.84
4	46.046186	-119.224550	1238.13	5.00	1243.13
5	46.048100	-119.224507	1248.38	5.00	1253.38

Name: US HWY 395-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.054961	-119.224314	1289.13	5.00	1294.13
2	46.057039	-119.224186	1313.71	5.00	1318.71
3	46.059696	-119.223950	1337.57	5.00	1342.57
4	46.062116	-119.223714	1348.33	5.00	1353.33
5	46.063009	-119.223660	1358.35	5.00	1363.35
6	46.064401	-119.223714	1378.78	5.00	1383.78
7	46.066173	-119.223832	1404.38	5.00	1409.38
8	46.067614	-119.223907	1425.76	5.00	1430.76
9	46.069192	-119.223724	1448.15	5.00	1453.15
10	46.070763	-119.223424	1468.64	5.00	1473.64

Name: US HWY 395-4
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.081318	-119.222539	1577.60	5.00	1582.60
2	46.082650	-119.222785	1589.94	5.00	1594.94
3	46.083878	-119.223032	1600.74	5.00	1605.74
4	46.085166	-119.223268	1615.92	5.00	1620.92
5	46.086163	-119.223451	1625.07	5.00	1630.07
6	46.087257	-119.223633	1633.34	5.00	1638.34
7	46.088760	-119.223697	1639.56	5.00	1644.56
8	46.089943	-119.223612	1639.85	5.00	1644.85

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 3-1	SA tracking	SA tracking	0	0	-
PV array 3-10	SA tracking	SA tracking	0	0	-
PV array 3-11	SA tracking	SA tracking	0	0	-
PV array 3-12	SA tracking	SA tracking	0	0	-
PV array 3-13	SA tracking	SA tracking	0	0	-
PV array 3-14	SA tracking	SA tracking	0	0	-
PV array 3-15	SA tracking	SA tracking	0	0	-
PV array 3-16	SA tracking	SA tracking	0	0	-
PV array 3-17	SA tracking	SA tracking	0	0	-
PV array 3-2	SA tracking	SA tracking	0	0	-
PV array 3-3	SA tracking	SA tracking	0	0	-
PV array 3-4	SA tracking	SA tracking	0	0	-
PV array 3-5	SA tracking	SA tracking	0	0	-
PV array 3-6	SA tracking	SA tracking	0	0	-
PV array 3-7	SA tracking	SA tracking	0	0	-
PV array 3-8	SA tracking	SA tracking	0	0	-
PV array 3-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Results for: PV array 3-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-13

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-14

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-15

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 3-16

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-17

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven East1-2nd floor**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 04:10 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46961.8449

PV Array(s)

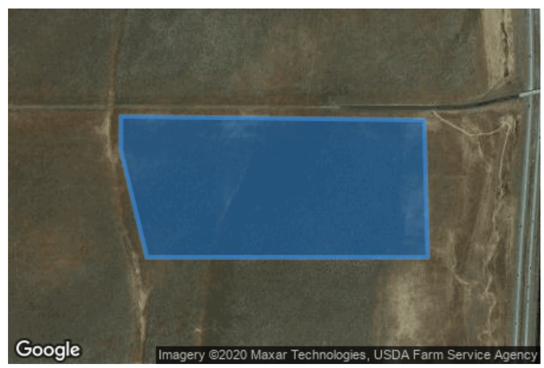
Name: PV array 3-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.069382	-119.264454	1544.06	7.00	1551.06
2	46.069263	-119.255786	1496.36	7.00	1503.36
3	46.067030	-119.254841	1465.97	7.00	1472.97
4	46.065094	-119.254863	1458.20	7.00	1465.20
5	46.062504	-119.256944	1443.28	7.00	1450.28
6	46.062712	-119.264755	1455.44	7.00	1462.44
7	46.069397	-119.264733	1546.85	7.00	1553.85

Name: PV array 3-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061648	-119.244412	1444.08	7.00	1451.08
2	46.061693	-119.239627	1424.05	7.00	1431.05
3	46.058998	-119.239391	1389.17	7.00	1396.17
4	46.058298	-119.239091	1378.12	7.00	1385.12
5	46.055737	-119.239091	1342.19	7.00	1349.19
6	46.055796	-119.244648	1362.40	7.00	1369.40
7	46.058476	-119.244627	1394.29	7.00	1401.29

Name: PV array 3-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061901	-119.238576	1428.54	7.00	1435.54
2	46.061052	-119.238576	1409.07	7.00	1416.07
3	46.058357	-119.237632	1369.29	7.00	1376.29
4	46.058357	-119.227439	1362.09	7.00	1369.09
5	46.061812	-119.227568	1414.75	7.00	1421.75

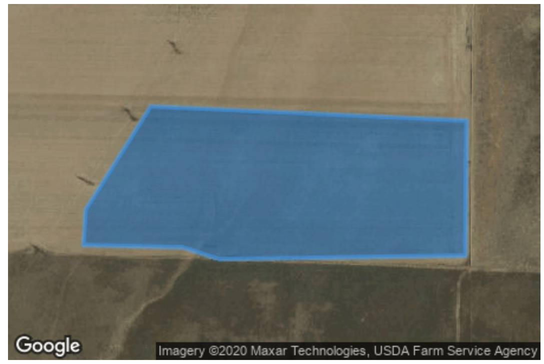
Name: PV array 3-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.058357	-119.234005	1375.86	7.00	1382.86
2	46.057434	-119.234134	1368.01	7.00	1375.01
3	46.056511	-119.234670	1355.03	7.00	1362.03
4	46.055856	-119.234692	1350.69	7.00	1357.69
5	46.055871	-119.232825	1362.74	7.00	1369.74
6	46.055022	-119.232825	1354.50	7.00	1361.50
7	46.055022	-119.229563	1346.52	7.00	1353.52
8	46.056064	-119.228812	1354.02	7.00	1361.02
9	46.056913	-119.227482	1351.79	7.00	1358.79
10	46.058372	-119.227461	1362.76	7.00	1369.76

Name: PV array 3-13
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.9°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

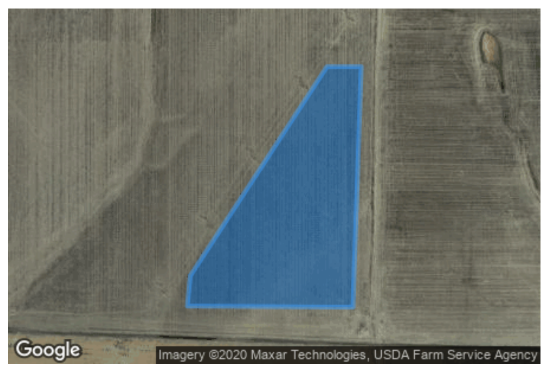
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060736	-119.221786	1390.15	7.00	1397.15
2	46.060706	-119.217752	1410.38	7.00	1417.38
3	46.061689	-119.217752	1398.79	7.00	1405.79
4	46.061600	-119.214233	1427.63	7.00	1434.63
5	46.060796	-119.214276	1420.95	7.00	1427.95
6	46.054750	-119.219898	1338.12	7.00	1345.13
7	46.054810	-119.222902	1329.50	7.00	1336.50
8	46.058026	-119.222816	1365.76	7.00	1372.76

Name: PV array 3-14
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.058324	-119.215134	1376.23	7.00	1383.23
2	46.057967	-119.203676	1398.27	7.00	1405.27
3	46.054572	-119.203719	1365.49	7.00	1372.49
4	46.054482	-119.212645	1352.42	7.00	1359.42
5	46.054780	-119.213975	1350.65	7.00	1357.65
6	46.054840	-119.217580	1329.72	7.00	1336.72
7	46.055733	-119.217494	1344.77	7.00	1351.77

Name: PV array 3-15
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.57°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.062523	-119.204276	1453.41	7.00	1460.41
2	46.068567	-119.203976	1534.61	7.00	1541.61
3	46.068567	-119.205221	1533.03	7.00	1540.03
4	46.063312	-119.210177	1461.61	7.00	1468.61
5	46.062553	-119.210285	1458.01	7.00	1465.01

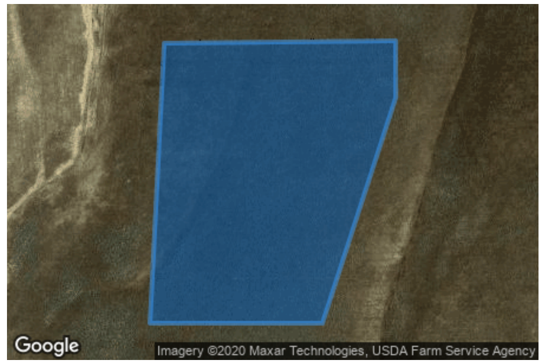
Name: PV array 3-16
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.067962	-119.203168	1531.20	7.00	1538.20
2	46.067917	-119.200550	1490.05	7.00	1497.05
3	46.067158	-119.199949	1481.33	7.00	1488.33
4	46.063763	-119.197975	1435.30	7.00	1442.30
5	46.062006	-119.197954	1429.33	7.00	1436.33
6	46.062036	-119.203254	1451.51	7.00	1458.51

Name: PV array 3-17
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.23°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

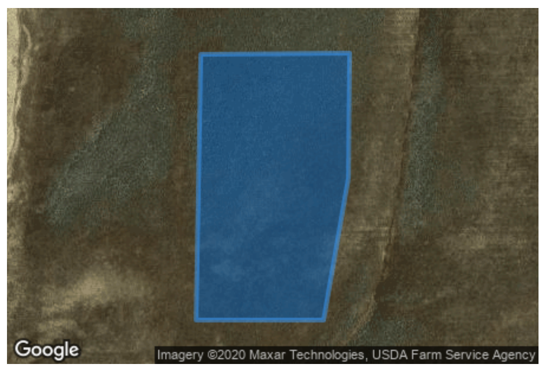
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061167	-119.203211	1444.79	7.00	1451.79
2	46.061137	-119.199370	1437.31	7.00	1444.31
3	46.058606	-119.197138	1390.82	7.00	1397.82
4	46.056774	-119.195700	1356.80	7.00	1363.80
5	46.054407	-119.195679	1346.44	7.00	1353.44
6	46.054451	-119.203318	1363.90	7.00	1370.90

Name: PV array 3-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



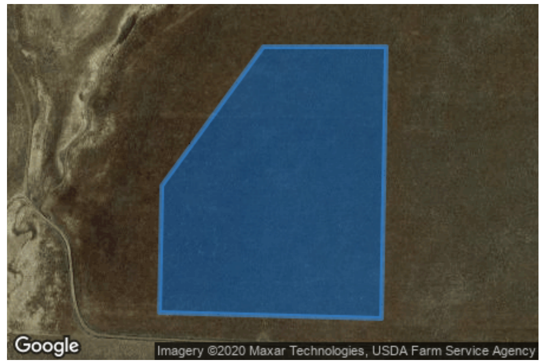
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.076111	-119.243769	1553.84	7.00	1560.84
2	46.076140	-119.239563	1570.47	7.00	1577.47
3	46.075426	-119.239563	1564.52	7.00	1571.52
4	46.072598	-119.240893	1541.36	7.00	1548.36
5	46.072598	-119.244026	1506.08	7.00	1513.08

Name: PV array 3-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



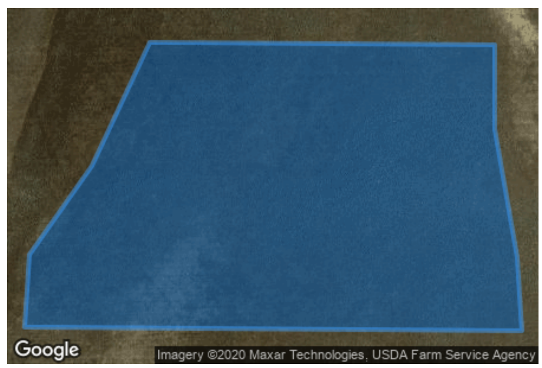
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.071824	-119.243812	1515.23	7.00	1522.23
2	46.071838	-119.241108	1533.04	7.00	1540.04
3	46.070275	-119.241129	1511.95	7.00	1518.95
4	46.068489	-119.241580	1481.38	7.00	1488.38
5	46.068489	-119.243898	1477.93	7.00	1484.93

Name: PV array 3-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.86°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.065943	-119.246923	1442.79	7.00	1449.79
2	46.065943	-119.244691	1470.32	7.00	1477.32
3	46.062534	-119.244777	1457.64	7.00	1464.64
4	46.062608	-119.248811	1423.57	7.00	1430.57
5	46.064201	-119.248768	1412.68	7.00	1419.68

Name: PV array 3-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.12°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

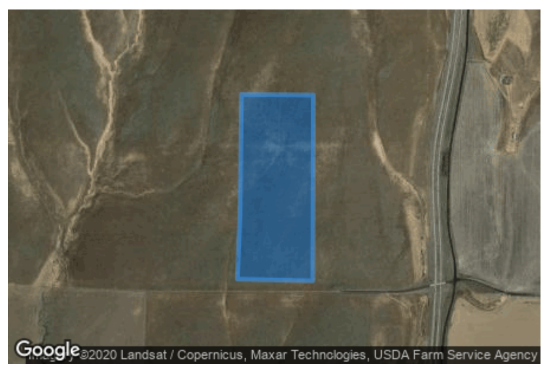


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.076141	-119.236412	1597.99	7.00	1604.99
2	46.076111	-119.230146	1594.28	7.00	1601.28
3	46.075054	-119.230146	1579.54	7.00	1586.54
4	46.073447	-119.229738	1547.68	7.00	1554.69
5	46.072524	-119.229653	1535.47	7.00	1542.47
6	46.072569	-119.238686	1542.55	7.00	1549.55
7	46.073477	-119.238600	1545.59	7.00	1552.59
8	46.074593	-119.237463	1574.18	7.00	1581.18

Name: PV array 3-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.065952	-119.237925	1463.27	7.00	1470.27
2	46.072056	-119.237774	1553.44	7.00	1560.45
3	46.072026	-119.239298	1527.90	7.00	1534.90
4	46.069421	-119.240028	1499.29	7.00	1506.29
5	46.068587	-119.240650	1480.07	7.00	1487.07
6	46.067605	-119.241916	1472.01	7.00	1479.01
7	46.067024	-119.243954	1460.39	7.00	1467.39
8	46.062796	-119.244190	1466.14	7.00	1473.14
9	46.062766	-119.239234	1436.41	7.00	1443.41
10	46.064374	-119.238729	1449.26	7.00	1456.26

Name: PV array 3-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

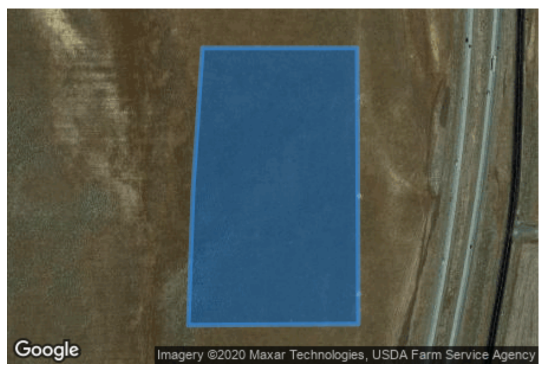


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.072075	-119.237810	1553.56	7.00	1560.57
2	46.072045	-119.232596	1553.16	7.00	1560.16
3	46.062681	-119.232639	1413.33	7.00	1420.33
4	46.062770	-119.238111	1441.44	7.00	1448.44
5	46.065971	-119.237917	1463.55	7.00	1470.55

Name: PV array 3-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.072071	-119.232642	1553.37	7.00	1560.37
2	46.072041	-119.229144	1520.15	7.00	1527.15
3	46.068468	-119.227900	1477.31	7.00	1484.31
4	46.066339	-119.226376	1445.67	7.00	1452.67
5	46.064642	-119.226333	1437.59	7.00	1444.59
6	46.062736	-119.227342	1420.78	7.00	1427.78
7	46.062707	-119.232663	1413.56	7.00	1420.56

Name: PV array 3-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.076121	-119.227108	1576.89	7.00	1583.89
2	46.076121	-119.224297	1556.62	7.00	1563.63
3	46.072653	-119.224276	1509.97	7.00	1516.97
4	46.072638	-119.227366	1523.47	7.00	1530.47
5	46.074350	-119.227280	1544.55	7.00	1551.55

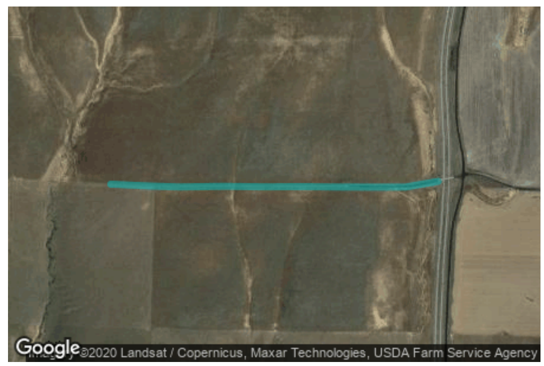
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.072705	-119.218667	1497.61	16.00
OP 2	2	46.125919	-119.219932	1320.29	16.00
OP 3	3	46.077101	-119.145764	1804.81	16.00
OP 4	4	46.065913	-119.078615	1520.73	16.00
OP 5	5	46.017217	-119.129341	1560.78	16.00
OP 6	6	46.100638	-119.351684	1835.32	16.00

Route Receptor(s)

Name: Beck Rd-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.062247	-119.247896	1437.68	9.00	1446.68
2	46.062165	-119.245439	1451.19	9.00	1460.19
3	46.062105	-119.242972	1440.64	9.00	1449.64
4	46.062143	-119.239603	1430.92	9.00	1439.92
5	46.062113	-119.236824	1424.17	9.00	1433.17
6	46.062128	-119.234152	1412.82	9.00	1421.82
7	46.062105	-119.231588	1420.12	9.00	1429.12
8	46.062098	-119.228252	1423.29	9.00	1432.29
9	46.062098	-119.226556	1405.15	9.00	1414.15
10	46.062388	-119.224142	1375.78	9.00	1384.78

Name: Beck Rd-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061852	-119.214432	1427.46	9.00	1436.46
2	46.061785	-119.211922	1443.52	9.00	1452.52
3	46.061696	-119.208124	1462.60	9.00	1471.60
4	46.061622	-119.205484	1447.52	9.00	1456.52
5	46.061547	-119.202823	1447.47	9.00	1456.47
6	46.061510	-119.199894	1440.39	9.00	1449.40
7	46.061480	-119.197910	1421.95	9.00	1430.95
8	46.061383	-119.197062	1392.62	9.00	1401.62

Name: Beck Rd-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061341	-119.187536	1433.77	9.00	1442.77
2	46.061267	-119.183567	1418.60	9.00	1427.60
3	46.061163	-119.178975	1433.57	9.00	1442.57
4	46.061088	-119.176786	1435.14	9.00	1444.14
5	46.060939	-119.173460	1462.67	9.00	1471.67
6	46.060805	-119.167988	1367.84	9.00	1376.84

Name: US HWY 395-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	45.995470	-119.278188	796.11	9.00	805.11
2	45.996052	-119.276000	804.07	9.00	813.07
3	45.997006	-119.272802	810.23	9.00	819.23
4	45.997468	-119.270850	813.31	9.00	822.31
5	45.997885	-119.268597	816.89	9.00	825.89
6	45.998362	-119.265335	816.50	9.00	825.50
7	45.998645	-119.263125	823.70	9.00	832.70
8	45.998958	-119.261687	823.48	9.00	832.48

Name: US HWY 395-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.037771	-119.224776	1159.99	9.00	1168.99
2	46.040459	-119.224690	1191.05	9.00	1200.05
3	46.042857	-119.224615	1214.84	9.00	1223.84
4	46.046186	-119.224550	1238.13	9.00	1247.13
5	46.048100	-119.224507	1248.38	9.00	1257.38

Name: US HWY 395-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.054961	-119.224314	1289.13	9.00	1298.13
2	46.057039	-119.224186	1313.71	9.00	1322.71
3	46.059696	-119.223950	1337.57	9.00	1346.57
4	46.062116	-119.223714	1348.33	9.00	1357.33
5	46.063009	-119.223660	1358.35	9.00	1367.35
6	46.064401	-119.223714	1378.78	9.00	1387.78
7	46.066173	-119.223832	1404.38	9.00	1413.39
8	46.067614	-119.223907	1425.76	9.00	1434.76
9	46.069192	-119.223724	1448.15	9.00	1457.15
10	46.070763	-119.223424	1468.64	9.00	1477.64

Name: US HWY 395-4
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.081318	-119.222539	1577.60	9.00	1586.60
2	46.082650	-119.222785	1589.94	9.00	1598.94
3	46.083878	-119.223032	1600.74	9.00	1609.74
4	46.085166	-119.223268	1615.92	9.00	1624.92
5	46.086163	-119.223451	1625.07	9.00	1634.07
6	46.087257	-119.223633	1633.34	9.00	1642.34
7	46.088760	-119.223697	1639.56	9.00	1648.56
8	46.089943	-119.223612	1639.85	9.00	1648.85

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 3-1	SA tracking	SA tracking	0	0	-
PV array 3-10	SA tracking	SA tracking	0	0	-
PV array 3-11	SA tracking	SA tracking	0	0	-
PV array 3-12	SA tracking	SA tracking	0	0	-
PV array 3-13	SA tracking	SA tracking	0	0	-
PV array 3-14	SA tracking	SA tracking	0	0	-
PV array 3-15	SA tracking	SA tracking	0	0	-
PV array 3-16	SA tracking	SA tracking	0	0	-
PV array 3-17	SA tracking	SA tracking	0	0	-
PV array 3-2	SA tracking	SA tracking	0	0	-
PV array 3-3	SA tracking	SA tracking	0	0	-
PV array 3-4	SA tracking	SA tracking	0	0	-
PV array 3-5	SA tracking	SA tracking	0	0	-
PV array 3-6	SA tracking	SA tracking	0	0	-
PV array 3-7	SA tracking	SA tracking	0	0	-
PV array 3-8	SA tracking	SA tracking	0	0	-
PV array 3-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Results for: PV array 3-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-13

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-14

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-15

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 3-16

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-17

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 3-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven East2-1st floor**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 04:11 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

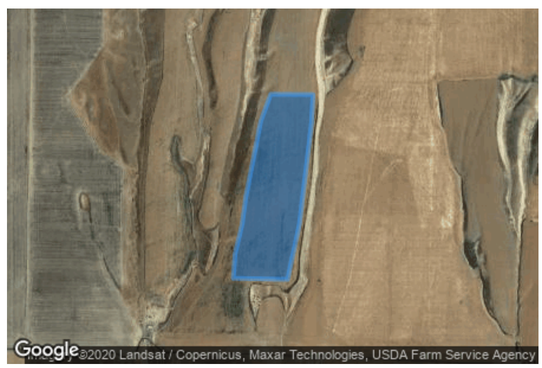
SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46964.8449

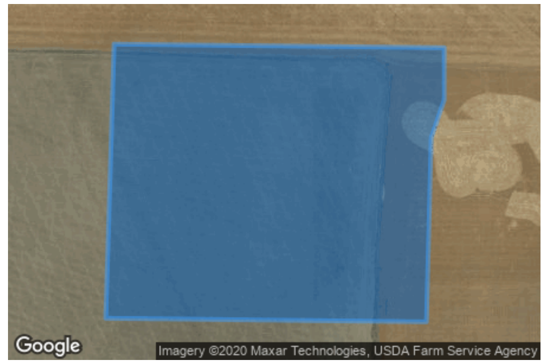
PV Array(s)

Name: PV array 4-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.074428	-119.185794	1604.10	7.00	1611.10
2	46.074413	-119.182725	1626.25	7.00	1633.25
3	46.072999	-119.182832	1592.62	7.00	1599.62
4	46.067922	-119.183712	1509.08	7.00	1516.08
5	46.065123	-119.184570	1478.31	7.00	1485.31
6	46.065183	-119.188519	1477.13	7.00	1484.13
7	46.066404	-119.188390	1476.95	7.00	1483.95
8	46.067892	-119.187875	1493.77	7.00	1500.77
9	46.069232	-119.187617	1514.73	7.00	1521.73
10	46.073073	-119.186523	1575.70	7.00	1582.70

Name: PV array 4-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

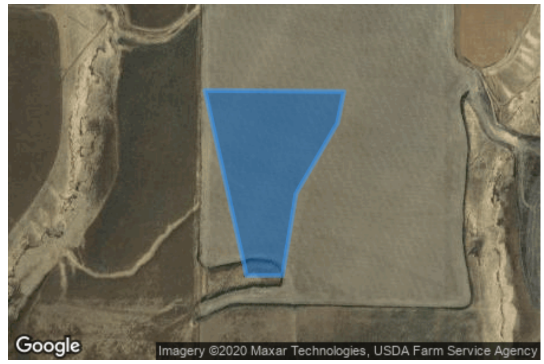


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.053662	-119.177753	1348.55	7.00	1355.55
2	46.050222	-119.177903	1300.14	7.00	1307.14
3	46.050178	-119.172088	1308.51	7.00	1315.51
4	46.052486	-119.172003	1327.98	7.00	1334.98
5	46.052962	-119.171767	1326.30	7.00	1333.30
6	46.053618	-119.171767	1334.02	7.00	1341.02

Name: PV array 4-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.050222	-119.177496	1301.38	7.00	1308.38
2	46.050133	-119.171080	1294.76	7.00	1301.76
3	46.048971	-119.170522	1285.48	7.00	1292.48
4	46.047959	-119.170586	1281.75	7.00	1288.75
5	46.045427	-119.172453	1270.46	7.00	1277.46
6	46.044310	-119.172475	1240.05	7.00	1247.05
7	46.044280	-119.182281	1251.59	7.00	1258.59
8	46.046097	-119.182238	1247.57	7.00	1254.57
9	46.049090	-119.177968	1294.24	7.00	1301.24
10	46.050222	-119.177903	1300.14	7.00	1307.14

Name: PV array 4-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.3°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.039660	-119.179496	1209.17	7.00	1216.17
2	46.039660	-119.180805	1218.17	7.00	1225.17
3	46.044307	-119.182307	1251.45	7.00	1258.45
4	46.044277	-119.177265	1259.38	7.00	1266.39
5	46.043488	-119.177501	1247.35	7.00	1254.35
6	46.041715	-119.179003	1230.31	7.00	1237.31

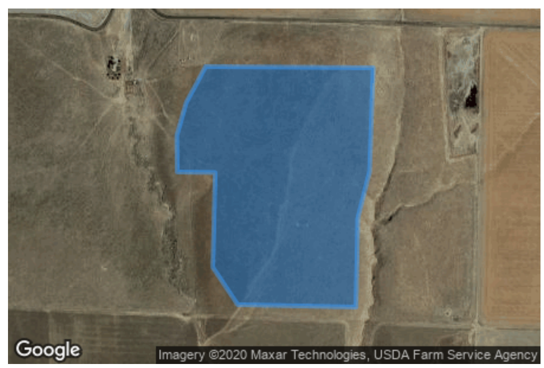
Name: PV array 4-13
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.9°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.044292	-119.177329	1259.37	7.00	1266.37
2	46.044322	-119.173102	1263.57	7.00	1270.57
3	46.042922	-119.173081	1238.95	7.00	1245.95
4	46.042385	-119.173209	1232.57	7.00	1239.57
5	46.041134	-119.173231	1214.53	7.00	1221.53
6	46.040434	-119.173038	1207.31	7.00	1214.31
7	46.039660	-119.173016	1202.76	7.00	1209.76
8	46.039660	-119.178445	1211.40	7.00	1218.41
9	46.040851	-119.178252	1224.53	7.00	1231.53
10	46.041745	-119.177608	1236.55	7.00	1243.55
11	46.043175	-119.176428	1250.31	7.00	1257.31
12	46.044322	-119.176385	1260.27	7.00	1267.27

Name: PV array 4-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.09°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.065183	-119.188583	1476.44	7.00	1483.44
2	46.065213	-119.189785	1447.65	7.00	1454.65
3	46.064557	-119.189870	1453.39	7.00	1460.40
4	46.064557	-119.190600	1432.32	7.00	1439.32
5	46.063664	-119.190729	1437.94	7.00	1444.94
6	46.063649	-119.191415	1419.44	7.00	1426.44
7	46.061803	-119.191523	1424.54	7.00	1431.54
8	46.061773	-119.187467	1443.18	7.00	1450.18
9	46.065168	-119.187381	1486.77	7.00	1493.77

Name: PV array 4-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.3°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060205	-119.192064	1407.22	7.00	1414.22
2	46.060175	-119.185991	1403.68	7.00	1410.68
3	46.057570	-119.186120	1358.40	7.00	1365.40
4	46.056393	-119.186549	1340.84	7.00	1347.84
5	46.054160	-119.186613	1310.97	7.00	1317.97
6	46.054219	-119.190905	1315.77	7.00	1322.77
7	46.055157	-119.191806	1318.49	7.00	1325.49
8	46.057540	-119.191720	1361.37	7.00	1368.37
9	46.057555	-119.193094	1357.36	7.00	1364.36
10	46.058463	-119.193115	1371.33	7.00	1378.33
11	46.059297	-119.192772	1385.11	7.00	1392.11

Name: PV array 4-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.071906	-119.180682	1573.72	7.00	1580.72
2	46.071876	-119.174931	1613.21	7.00	1620.21
3	46.071251	-119.173236	1585.72	7.00	1592.72
4	46.066278	-119.173300	1497.98	7.00	1504.98
5	46.066293	-119.181519	1494.40	7.00	1501.40

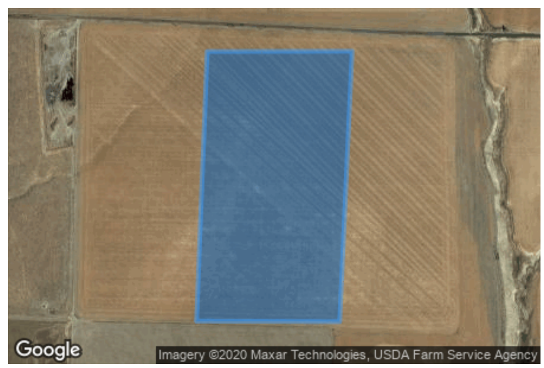
Name: PV array 4-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.066293	-119.181562	1493.38	7.00	1500.38
2	46.063271	-119.181626	1468.34	7.00	1475.34
3	46.063286	-119.182806	1447.23	7.00	1454.23
4	46.062095	-119.182806	1440.75	7.00	1447.75
5	46.061514	-119.181776	1439.80	7.00	1446.80
6	46.061425	-119.171176	1442.27	7.00	1449.27
7	46.062854	-119.171198	1443.64	7.00	1450.64
8	46.062884	-119.172528	1470.54	7.00	1477.54
9	46.066278	-119.172485	1486.35	7.00	1493.35

Name: PV array 4-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

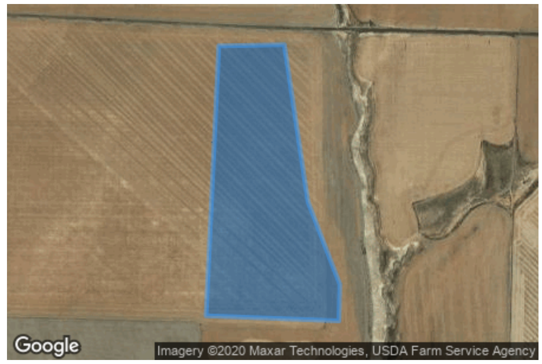
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060885	-119.181647	1424.58	7.00	1431.58
2	46.060856	-119.177377	1429.63	7.00	1436.63
3	46.053619	-119.177721	1348.88	7.00	1355.88
4	46.053678	-119.182034	1364.82	7.00	1371.82

Name: PV array 4-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060394	-119.177377	1427.17	7.00	1434.17
2	46.060401	-119.172120	1447.89	7.00	1454.89
3	46.053612	-119.172571	1344.82	7.00	1351.82
4	46.053627	-119.177764	1348.27	7.00	1355.27

Name: PV array 4-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060403	-119.172142	1448.13	7.00	1455.13
2	46.060433	-119.169760	1415.08	7.00	1422.08
3	46.056487	-119.168902	1384.97	7.00	1391.97
4	46.054418	-119.167743	1352.42	7.00	1359.42
5	46.053502	-119.167775	1340.94	7.00	1347.94
6	46.053628	-119.172603	1345.18	7.00	1352.18

Name: PV array 4-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.053677	-119.182088	1364.58	7.00	1371.58
2	46.047601	-119.182195	1269.38	7.00	1276.38
3	46.047601	-119.181337	1270.62	7.00	1277.62
4	46.048808	-119.180092	1283.59	7.00	1290.59
5	46.050222	-119.177882	1300.11	7.00	1307.11
6	46.053618	-119.177689	1349.33	7.00	1356.33

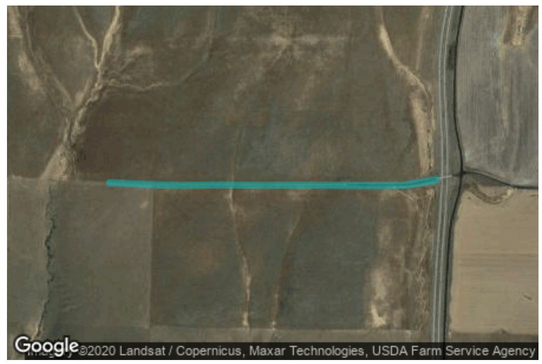
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.072705	-119.218667	1497.61	6.00
OP 2	2	46.125919	-119.219932	1320.29	6.00
OP 3	3	46.077101	-119.145764	1804.81	6.00
OP 4	4	46.065913	-119.078615	1520.73	6.00
OP 5	5	46.017217	-119.129341	1560.78	6.00
OP 6	6	46.100638	-119.351684	1835.32	6.00

Route Receptor(s)

Name: Beck Rd-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.062247	-119.247896	1437.68	5.00	1442.68
2	46.062165	-119.245439	1451.19	5.00	1456.19
3	46.062105	-119.242972	1440.64	5.00	1445.64
4	46.062143	-119.239603	1430.92	5.00	1435.92
5	46.062113	-119.236824	1424.17	5.00	1429.17
6	46.062128	-119.234152	1412.82	5.00	1417.82
7	46.062105	-119.231588	1420.12	5.00	1425.12
8	46.062098	-119.228252	1423.29	5.00	1428.29
9	46.062098	-119.226556	1405.15	5.00	1410.15
10	46.062388	-119.224142	1375.78	5.00	1380.78

Name: Beck Rd-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061852	-119.214432	1427.46	5.00	1432.46
2	46.061785	-119.211922	1443.52	5.00	1448.52
3	46.061696	-119.208124	1462.60	5.00	1467.60
4	46.061622	-119.205484	1447.52	5.00	1452.52
5	46.061547	-119.202823	1447.47	5.00	1452.47
6	46.061510	-119.199894	1440.39	5.00	1445.39
7	46.061480	-119.197910	1421.95	5.00	1426.95
8	46.061383	-119.197062	1392.62	5.00	1397.62

Name: Beck Rd-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061341	-119.187536	1433.77	5.00	1438.77
2	46.061267	-119.183567	1418.60	5.00	1423.60
3	46.061163	-119.178975	1433.57	5.00	1438.57
4	46.061088	-119.176786	1435.14	5.00	1440.14
5	46.060939	-119.173460	1462.67	5.00	1467.67
6	46.060805	-119.167988	1367.84	5.00	1372.84

Name: US HWY 395-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	45.995519	-119.278077	796.24	5.00	801.24
2	45.996115	-119.275952	803.46	5.00	808.46
3	45.996950	-119.273013	808.72	5.00	813.72
4	45.997457	-119.271038	813.88	5.00	818.88
5	45.997964	-119.268356	815.97	5.00	820.97
6	45.998321	-119.265288	814.61	5.00	819.61
7	45.998634	-119.263206	823.31	5.00	828.31
8	45.998947	-119.261683	823.78	5.00	828.78

Name: US HWY 395-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.037771	-119.224776	1159.99	5.00	1164.99
2	46.040459	-119.224690	1191.05	5.00	1196.05
3	46.042857	-119.224615	1214.84	5.00	1219.84
4	46.046186	-119.224550	1238.13	5.00	1243.13
5	46.048100	-119.224507	1248.38	5.00	1253.38

Name: US HWY 395-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.054961	-119.224314	1289.13	5.00	1294.13
2	46.057039	-119.224186	1313.71	5.00	1318.71
3	46.059696	-119.223950	1337.57	5.00	1342.57
4	46.062116	-119.223714	1348.33	5.00	1353.33
5	46.063009	-119.223660	1358.35	5.00	1363.35
6	46.064401	-119.223714	1378.78	5.00	1383.78
7	46.066173	-119.223832	1404.38	5.00	1409.38
8	46.067614	-119.223907	1425.76	5.00	1430.76
9	46.069192	-119.223724	1448.15	5.00	1453.15
10	46.070763	-119.223424	1468.64	5.00	1473.64

Name: US HWY 395-4
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.081318	-119.222539	1577.60	5.00	1582.60
2	46.082650	-119.222785	1589.94	5.00	1594.94
3	46.083878	-119.223032	1600.74	5.00	1605.74
4	46.085166	-119.223268	1615.92	5.00	1620.92
5	46.086163	-119.223451	1625.07	5.00	1630.07
6	46.087257	-119.223633	1633.34	5.00	1638.34
7	46.088760	-119.223697	1639.56	5.00	1644.56
8	46.089943	-119.223612	1639.85	5.00	1644.85

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 4-1	SA tracking	SA tracking	0	0	-
PV array 4-10	SA tracking	SA tracking	0	0	-
PV array 4-11	SA tracking	SA tracking	0	0	-
PV array 4-12	SA tracking	SA tracking	0	0	-
PV array 4-13	SA tracking	SA tracking	0	0	-
PV array 4-2	SA tracking	SA tracking	0	0	-
PV array 4-3	SA tracking	SA tracking	0	0	-
PV array 4-4	SA tracking	SA tracking	0	0	-
PV array 4-5	SA tracking	SA tracking	0	0	-
PV array 4-6	SA tracking	SA tracking	0	0	-
PV array 4-7	SA tracking	SA tracking	0	0	-
PV array 4-8	SA tracking	SA tracking	0	0	-
PV array 4-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Results for: PV array 4-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 4-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-13

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 4-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size.
Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

FORGESOLAR GLARE ANALYSIS

Project: **Horse Heaven**
Site configuration: **Horse Heaven East2-2nd floor**
Analysis conducted by Josh Burdett (joshua.burdett@tetratech.com) at 04:12 on 15 Dec, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

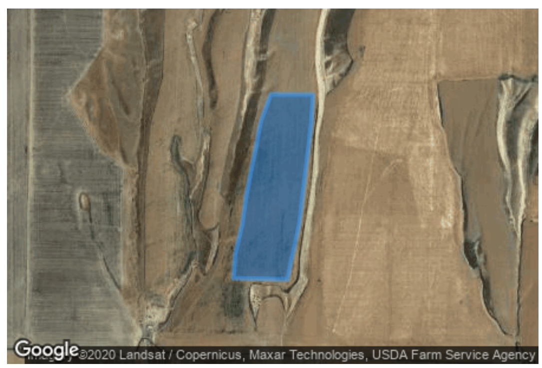
SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 46965.8449

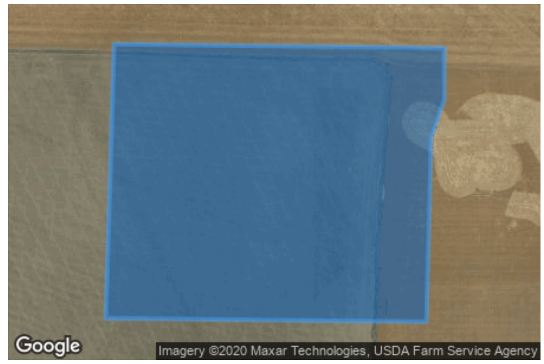
PV Array(s)

Name: PV array 4-1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.074428	-119.185794	1604.10	7.00	1611.10
2	46.074413	-119.182725	1626.25	7.00	1633.25
3	46.072999	-119.182832	1592.62	7.00	1599.62
4	46.067922	-119.183712	1509.08	7.00	1516.08
5	46.065123	-119.184570	1478.31	7.00	1485.31
6	46.065183	-119.188519	1477.13	7.00	1484.13
7	46.066404	-119.188390	1476.95	7.00	1483.95
8	46.067892	-119.187875	1493.77	7.00	1500.77
9	46.069232	-119.187617	1514.73	7.00	1521.73
10	46.073073	-119.186523	1575.70	7.00	1582.70

Name: PV array 4-10
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

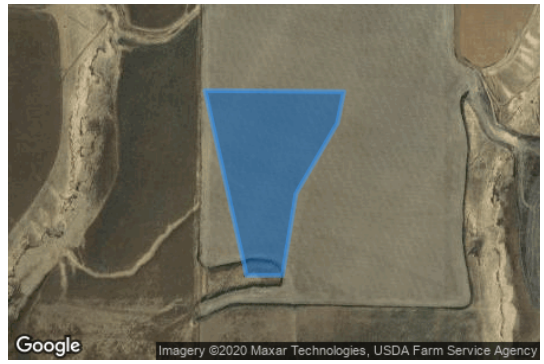


Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.053662	-119.177753	1348.55	7.00	1355.55
2	46.050222	-119.177903	1300.14	7.00	1307.14
3	46.050178	-119.172088	1308.51	7.00	1315.51
4	46.052486	-119.172003	1327.98	7.00	1334.98
5	46.052962	-119.171767	1326.30	7.00	1333.30
6	46.053618	-119.171767	1334.02	7.00	1341.02

Name: PV array 4-11
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.050222	-119.177496	1301.38	7.00	1308.38
2	46.050133	-119.171080	1294.76	7.00	1301.76
3	46.048971	-119.170522	1285.48	7.00	1292.48
4	46.047959	-119.170586	1281.75	7.00	1288.75
5	46.045427	-119.172453	1270.46	7.00	1277.46
6	46.044310	-119.172475	1240.05	7.00	1247.05
7	46.044280	-119.182281	1251.59	7.00	1258.59
8	46.046097	-119.182238	1247.57	7.00	1254.57
9	46.049090	-119.177968	1294.24	7.00	1301.24
10	46.050222	-119.177903	1300.14	7.00	1307.14

Name: PV array 4-12
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.3°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.039660	-119.179496	1209.17	7.00	1216.17
2	46.039660	-119.180805	1218.17	7.00	1225.17
3	46.044307	-119.182307	1251.45	7.00	1258.45
4	46.044277	-119.177265	1259.38	7.00	1266.39
5	46.043488	-119.177501	1247.35	7.00	1254.35
6	46.041715	-119.179003	1230.31	7.00	1237.31

Name: PV array 4-13
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.9°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.044292	-119.177329	1259.37	7.00	1266.37
2	46.044322	-119.173102	1263.57	7.00	1270.57
3	46.042922	-119.173081	1238.95	7.00	1245.95
4	46.042385	-119.173209	1232.57	7.00	1239.57
5	46.041134	-119.173231	1214.53	7.00	1221.53
6	46.040434	-119.173038	1207.31	7.00	1214.31
7	46.039660	-119.173016	1202.76	7.00	1209.76
8	46.039660	-119.178445	1211.40	7.00	1218.41
9	46.040851	-119.178252	1224.53	7.00	1231.53
10	46.041745	-119.177608	1236.55	7.00	1243.55
11	46.043175	-119.176428	1250.31	7.00	1257.31
12	46.044322	-119.176385	1260.27	7.00	1267.27

Name: PV array 4-2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 1.09°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.065183	-119.188583	1476.44	7.00	1483.44
2	46.065213	-119.189785	1447.65	7.00	1454.65
3	46.064557	-119.189870	1453.39	7.00	1460.40
4	46.064557	-119.190600	1432.32	7.00	1439.32
5	46.063664	-119.190729	1437.94	7.00	1444.94
6	46.063649	-119.191415	1419.44	7.00	1426.44
7	46.061803	-119.191523	1424.54	7.00	1431.54
8	46.061773	-119.187467	1443.18	7.00	1450.18
9	46.065168	-119.187381	1486.77	7.00	1493.77

Name: PV array 4-3
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.3°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060205	-119.192064	1407.22	7.00	1414.22
2	46.060175	-119.185991	1403.68	7.00	1410.68
3	46.057570	-119.186120	1358.40	7.00	1365.40
4	46.056393	-119.186549	1340.84	7.00	1347.84
5	46.054160	-119.186613	1310.97	7.00	1317.97
6	46.054219	-119.190905	1315.77	7.00	1322.77
7	46.055157	-119.191806	1318.49	7.00	1325.49
8	46.057540	-119.191720	1361.37	7.00	1368.37
9	46.057555	-119.193094	1357.36	7.00	1364.36
10	46.058463	-119.193115	1371.33	7.00	1378.33
11	46.059297	-119.192772	1385.11	7.00	1392.11

Name: PV array 4-4
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.071906	-119.180682	1573.72	7.00	1580.72
2	46.071876	-119.174931	1613.21	7.00	1620.21
3	46.071251	-119.173236	1585.72	7.00	1592.72
4	46.066278	-119.173300	1497.98	7.00	1504.98
5	46.066293	-119.181519	1494.40	7.00	1501.40

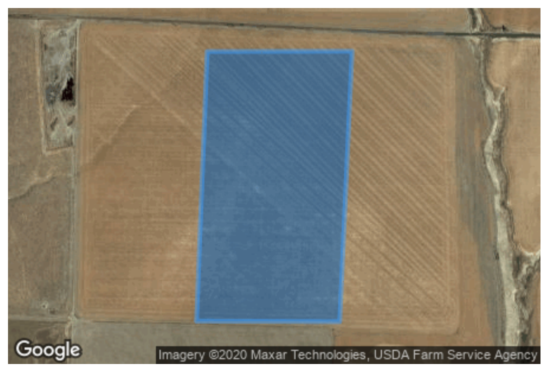
Name: PV array 4-5
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.066293	-119.181562	1493.38	7.00	1500.38
2	46.063271	-119.181626	1468.34	7.00	1475.34
3	46.063286	-119.182806	1447.23	7.00	1454.23
4	46.062095	-119.182806	1440.75	7.00	1447.75
5	46.061514	-119.181776	1439.80	7.00	1446.80
6	46.061425	-119.171176	1442.27	7.00	1449.27
7	46.062854	-119.171198	1443.64	7.00	1450.64
8	46.062884	-119.172528	1470.54	7.00	1477.54
9	46.066278	-119.172485	1486.35	7.00	1493.35

Name: PV array 4-6
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

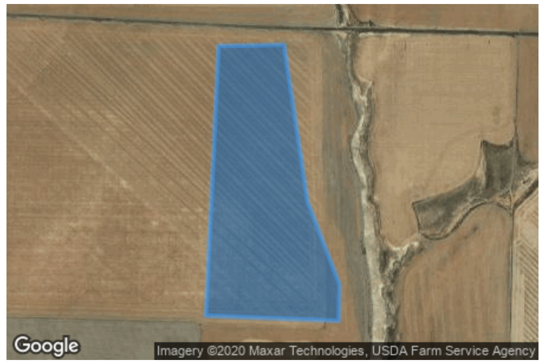
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060885	-119.181647	1424.58	7.00	1431.58
2	46.060856	-119.177377	1429.63	7.00	1436.63
3	46.053619	-119.177721	1348.88	7.00	1355.88
4	46.053678	-119.182034	1364.82	7.00	1371.82

Name: PV array 4-7
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060394	-119.177377	1427.17	7.00	1434.17
2	46.060401	-119.172120	1447.89	7.00	1454.89
3	46.053612	-119.172571	1344.82	7.00	1351.82
4	46.053627	-119.177764	1348.27	7.00	1355.27

Name: PV array 4-8
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.35°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.060403	-119.172142	1448.13	7.00	1455.13
2	46.060433	-119.169760	1415.08	7.00	1422.08
3	46.056487	-119.168902	1384.97	7.00	1391.97
4	46.054418	-119.167743	1352.42	7.00	1359.42
5	46.053502	-119.167775	1340.94	7.00	1347.94
6	46.053628	-119.172603	1345.18	7.00	1352.18

Name: PV array 4-9
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.4°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 10.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.053677	-119.182088	1364.58	7.00	1371.58
2	46.047601	-119.182195	1269.38	7.00	1276.38
3	46.047601	-119.181337	1270.62	7.00	1277.62
4	46.048808	-119.180092	1283.59	7.00	1290.59
5	46.050222	-119.177882	1300.11	7.00	1307.11
6	46.053618	-119.177689	1349.33	7.00	1356.33

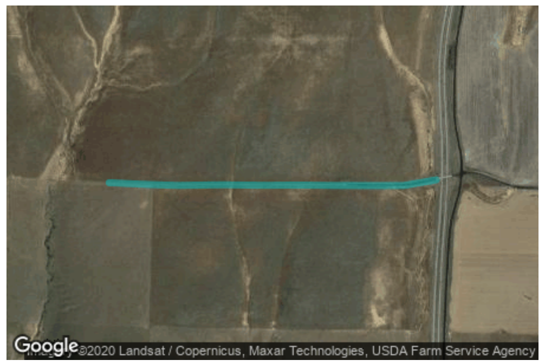
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.072705	-119.218667	1497.61	16.00
OP 2	2	46.125919	-119.219932	1320.29	16.00
OP 3	3	46.077101	-119.145764	1804.81	16.00
OP 4	4	46.065913	-119.078615	1520.73	16.00
OP 5	5	46.017217	-119.129341	1560.78	16.00
OP 6	6	46.100638	-119.351684	1835.32	16.00

Route Receptor(s)

Name: Beck Rd-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.062247	-119.247896	1437.68	9.00	1446.68
2	46.062165	-119.245439	1451.19	9.00	1460.19
3	46.062105	-119.242972	1440.64	9.00	1449.64
4	46.062143	-119.239603	1430.92	9.00	1439.92
5	46.062113	-119.236824	1424.17	9.00	1433.17
6	46.062128	-119.234152	1412.82	9.00	1421.82
7	46.062105	-119.231588	1420.12	9.00	1429.12
8	46.062098	-119.228252	1423.29	9.00	1432.29
9	46.062098	-119.226556	1405.15	9.00	1414.15
10	46.062388	-119.224142	1375.78	9.00	1384.78

Name: Beck Rd-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061852	-119.214432	1427.46	9.00	1436.46
2	46.061785	-119.211922	1443.52	9.00	1452.52
3	46.061696	-119.208124	1462.60	9.00	1471.60
4	46.061622	-119.205484	1447.52	9.00	1456.52
5	46.061547	-119.202823	1447.47	9.00	1456.47
6	46.061510	-119.199894	1440.39	9.00	1449.40
7	46.061480	-119.197910	1421.95	9.00	1430.95
8	46.061383	-119.197062	1392.62	9.00	1401.62

Name: Beck Rd-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.061341	-119.187536	1433.77	9.00	1442.77
2	46.061267	-119.183567	1418.60	9.00	1427.60
3	46.061163	-119.178975	1433.57	9.00	1442.57
4	46.061088	-119.176786	1435.14	9.00	1444.14
5	46.060939	-119.173460	1462.67	9.00	1471.67
6	46.060805	-119.167988	1367.84	9.00	1376.84

Name: US HWY 395-1
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	45.995519	-119.278077	796.24	9.00	805.24
2	45.996115	-119.275952	803.46	9.00	812.46
3	45.996950	-119.273013	808.72	9.00	817.72
4	45.997457	-119.271038	813.88	9.00	822.88
5	45.997964	-119.268356	815.97	9.00	824.98
6	45.998321	-119.265288	814.61	9.00	823.61
7	45.998634	-119.263206	823.31	9.00	832.31
8	45.998947	-119.261683	823.78	9.00	832.78

Name: US HWY 395-2
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.037771	-119.224776	1159.99	9.00	1168.99
2	46.040459	-119.224690	1191.05	9.00	1200.05
3	46.042857	-119.224615	1214.84	9.00	1223.84
4	46.046186	-119.224550	1238.13	9.00	1247.13
5	46.048100	-119.224507	1248.38	9.00	1257.38

Name: US HWY 395-3
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.054961	-119.224314	1289.13	9.00	1298.13
2	46.057039	-119.224186	1313.71	9.00	1322.71
3	46.059696	-119.223950	1337.57	9.00	1346.57
4	46.062116	-119.223714	1348.33	9.00	1357.33
5	46.063009	-119.223660	1358.35	9.00	1367.35
6	46.064401	-119.223714	1378.78	9.00	1387.78
7	46.066173	-119.223832	1404.38	9.00	1413.39
8	46.067614	-119.223907	1425.76	9.00	1434.76
9	46.069192	-119.223724	1448.15	9.00	1457.15
10	46.070763	-119.223424	1468.64	9.00	1477.64

Name: US HWY 395-4
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.081318	-119.222539	1577.60	5.00	1582.60
2	46.082650	-119.222785	1589.94	5.00	1594.94
3	46.083878	-119.223032	1600.74	5.00	1605.74
4	46.085166	-119.223268	1615.92	5.00	1620.92
5	46.086163	-119.223451	1625.07	5.00	1630.07
6	46.087257	-119.223633	1633.34	5.00	1638.34
7	46.088760	-119.223697	1639.56	5.00	1644.56
8	46.089943	-119.223612	1639.85	5.00	1644.85

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 4-1	SA tracking	SA tracking	0	0	-
PV array 4-10	SA tracking	SA tracking	0	0	-
PV array 4-11	SA tracking	SA tracking	0	0	-
PV array 4-12	SA tracking	SA tracking	0	0	-
PV array 4-13	SA tracking	SA tracking	0	0	-
PV array 4-2	SA tracking	SA tracking	0	0	-
PV array 4-3	SA tracking	SA tracking	0	0	-
PV array 4-4	SA tracking	SA tracking	0	0	-
PV array 4-5	SA tracking	SA tracking	0	0	-
PV array 4-6	SA tracking	SA tracking	0	0	-
PV array 4-7	SA tracking	SA tracking	0	0	-
PV array 4-8	SA tracking	SA tracking	0	0	-
PV array 4-9	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Results for: PV array 4-1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 4-10

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-12

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-13

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-3

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare

0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-5

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-6

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare

0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4-8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare

0 minutes of green glare

Results for: PV array 4-9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
Beck Rd-1	0	0
Beck Rd-2	0	0
Beck Rd-3	0	0
US HWY 395-1	0	0
US HWY 395-2	0	0
US HWY 395-3	0	0
US HWY 395-4	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-1

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-2

0 minutes of yellow glare
0 minutes of green glare

Route: Beck Rd-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-1

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-2

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-3

0 minutes of yellow glare
0 minutes of green glare

Route: US HWY 395-4

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

APPENDIX 4.11-1

Inputs for Noise Modeling Assessment

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Inputs for Noise Modeling Assessment

Noise sources are input in terms of frequency distributed sound power levels, which are outlined in the source tables below. This provides not only an overall noise source, but also how that overall noise is distributed across octave band frequencies (low to high). Coordinates for sources, receptors, and any other object can be specified by the user. All noise sources are assumed to be point sources.

Sound propagation is calculated by accounting for distance attenuation via hemispherical spreading and three other user-identified noise attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified in the International Standards Organization Attenuation of Sound During Propagation Outdoors, Part 1: Calculations of the Absorption of Sound by the Atmosphere (ISO 19931). Path-specific attenuation can be specified to account for the effects of ground, vegetation, foliage, and wind shadow. Directional source characteristics and reflection can be simulated using path-specific attenuation. Attenuation due to barriers can be specified by giving the coordinates of the barrier. Barrier attenuation is calculated by assuming a defined barrier perpendicular to the source-receptor path. Total and A-weighted sound pressure levels (SPLs) are calculated.

Table 4.11-1A lists the configuration of the calculation parameters used to complete noise modeling for the Project.

Table 4.11-1A: Noise Model Configuration Parameters

Parameter	Model Setting	Description/Notes
Standards	ISO 9613 only	All sources and attenuators are treated as required by the cited standard.
Directivity	k-factor = 2 dBA (for Turbine blade noise sources)	Assumed that turbine blade directivity and sound-generating efficiencies are inherently incorporated in the noise source data used in developing the acoustic model. The specification for the turbines includes an expected warranty confidence interval, or k-factor, which was added to the nominal sound power level in the acoustic model.
Ground Absorption	0.5	Mixed (semi-reflective) soft and hard ground, conservative assumption given the area is mostly composed of fields.
Temperature/humidity	10°C (50° F) / 70% relative humidity	Assumed weather conditions.
Wind Conditions	Default ISO 9613-2 – moderate inversion condition	The propagation conditions in the ISO standard are valid for wind speeds between 4 and 18 km/hr; all points are considered downwind (omnidirectional).
Terrain	Existing terrain considered	Existing ridgeline and changes in elevation in the impact area will affect sound propagation.
Operations	Continuous	All equipment operating continuously during the daytime and at night. Conservative assumption considering operations will be dependent on weather conditions.
Noise Mitigation	None	The model does not include natural buffers, existing or future foliage, or existing or future buildings or structures.

Source: Horse Heaven Wind Farm, LLC. 2022. Horse Heaven Wind Farm Washington Energy Facility Site Evaluation Council Updated Application for Site Certification EFSEC Docket Number: EF-210011. February 2021, Revised December 2022.
°C = degrees Celsius; °F = degrees Fahrenheit; dBA = A-weighted decibels; ISO = International Standards Organization; km/hr = kilometers per hour

[1] ISO (International Organization for Standardization). 1993. Standard ISO 9613-2 Acoustics – Attenuation of Sound during Propagation Outdoors. Part 2 General Method of Calculation. Geneva, Switzerland.

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APPENDIX 4.16-1

Technical Review of Horse Heaven Wind Farm, LLC's Economic Impact Analysis Methodology

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Economic IMPLAN Model

Tetra Tech, Inc. on behalf of Horse Heaven Windfarm, LLC (the Applicant), prepared an IMPLAN analysis of the Horse Heaven Wind Farm (Project) (Horse Heaven Wind Farm, LLC 2022[1]). IMPLAN is a regional input-output model widely used to assess the economic impacts of energy and many other types of projects. The IMPLAN model divides the economy into 546 sectors, including government, households, farms, and various industries, and models the linkages between the various sectors. The linkages are modeled through input-output tables that account for all dollar flows among different sectors of the economy.

Using national industry and state-level economic data derived from the U.S. Bureau of Economic Analysis, U.S. Census, and other government sources, IMPLAN models how money spent in one sector of the economy is spent and re-spent in other sectors. By tracing these linkages, the model approximates the flows of initial project spending through the local economy based on the supply lines connecting the various economic sectors. These linkages vary by sector, as well as through regional differences in spending and employment patterns. The amount spent locally decreases with each successive transaction away from the initial expenditure due to the effects of savings, taxes, or other activities that happen outside the local economy, known as leakages.

The economic relationships modeled by IMPLAN allow the user to estimate the overall change in the economy that would result from construction and operation of a proposed project. The dollars spent on project construction and operation within a selected analysis area are analyzed to determine the total economic impact within that area. The direct investments in project construction and operation trigger successive rounds of spending that result in an overall increase in employment, labor income, and economic output in the local economy. Construction-related impacts are assessed as one-time impacts; operations and maintenance–related impacts are modeled as annual impacts (Horse Heaven Wind Farm, LLC 2022).

Workforce Requirements and Economic Impacts

For the Project, Project Management and Engineers would account for 3 to 4 percent of total employment for conceptualized Phases 1, 2a, and 2b, and Field Technical Staff would account for 9 to 11 percent, viewed in terms of total months of employment. The remaining employment would be made up of Skilled Labor and Equipment Operators and Unskilled Labor, with the relative distribution between these categories varying by task (Horse Heaven Wind Farm, LLC 2022). Workers in the Skilled Labor and Equipment Operators category, for example, would account for the majority of employment during wind turbine assembly, while the majority of the workforce installing turbine foundations would fall under the Unskilled Labor category.

Table 4.16-1A provides an estimate of the workforce necessary to construct Phases 1, 2a, and 2b. The Applicant anticipates that on-site jobs would be filled mostly by local workers. Classes of on-site jobs include those associated with site work, foundations, electrical work, and other construction-related labor needs. The Applicant acknowledges in the Application for Site Certification that workers from outside the region may be required to fill certain on-site positions. However, the Applicant did not include the potential for non-local workers in their workforce estimates but did evaluate the impact of per diem spending by non-local workers on the region's economy. These estimates are one-time impacts for the 11-month construction period developed using the IMPLAN modeling software and 2019 IMPLAN data for Benton and Franklin Counties.

[1] Horse Heaven Wind Farm, LLC. 2022. Horse Heaven Wind Farm Washington Energy Facility Site Evaluation Council Updated Application for Site Certification EFSEC Docket Number: EF-210011. February 2021, Revised December 2022.

The employment estimates presented in the ASC represent the average and peak numbers of people expected to be employed on site at one time and are not expressed in full-time equivalents. The workforce estimates provided by the Applicant assume that the Project would be built under a community workforce or Project labor agreement that would include the use of apprentices for 15 percent of the labor hours. The economic impact analysis, therefore, increased initial workforce estimates by 15 percent to account for apprentices.

Table 4.16-1A: Average Monthly Workforce Estimates by Technical Professional and Level

Task	Phase	Project Management and Engineers	Field Technical Staff	Skilled Labor and Equipment Operators	Unskilled Labor	Apprentice
Final Engineering and Design	1	5	0	0	0	0
Pre-Construction Survey and Compliance Requirements	1	1	4	0	0	0
Road Construction	1	2	1	15	12	5
Wind Turbine Foundations	1	2	5	30	88	19
Wind Turbine Assembly	1	2	10	118	20	23
Wind Plant Commissioning	1	1	19	0	0	3
Solar Array Construction	1	3	4	14	40	70
Electrical System Installation	1	2	5	19	56	12
Battery Energy Storage System	1	1	2	6	18	4
Solar Plant Commissioning	1	1	1	5	15	3
Electrical System and Substation	1	2	10	28	10	8
O&M Facilities	1	2	5	10	18	5
Final Engineering and Design	2a	5	0	0	0	0
Pre-Construction Survey and Compliance Requirements	2a	1	4	0	0	0
Road Construction	2a	2	1	13	10	4
Wind Turbine Foundations	2a	2	3	20	63	13
Wind Turbine Assembly	2a	2	7	81	15	16
Wind Plant Commissioning	2a	1	15	0	0	2

Table 4.16-1A: Average Monthly Workforce Estimates by Technical Professional and Level

Task	Phase	Project Management and Engineers	Field Technical Staff	Skilled Labor and Equipment Operators	Unskilled Labor	Apprentice
Solar Array Construction	2a	3	3	12	33	8
Electrical System Installation	2a	2	4	16	47	10
Battery Energy Storage System	2a	1	2	6	18	4
Solar Plant Commissioning	2a	1	1	4	13	3
Electrical System and Substation	2a	3	15	38	15	11
O&M Facilities	2a	2	5	10	18	5
Transmission Line Construction	2a	1	2	12	0	2
Final Engineering and Design	2b	5	0	0	0	0
Pre-Construction Survey and Compliance Requirements	2b	1	4	0	0	0
Road Construction	2b	4	1	25	20	8
Wind Turbine Foundations	2b	3	7	40	125	26
Electrical System and Substation	2b	3	15	38	15	11
Wind Turbine Assembly	2b	3	14	162	31	32
O&M Facilities	2b	2	5	10	18	5
Transmission Line Construction	2b	2	4	23	0	4
Plant Commissioning	2b	1	29	0	0	5

Sources:
Horse Heaven Wind Farm, LLC. 2022. Horse Heaven Wind Farm Washington Energy Facility Site Evaluation Council Updated Application for Site Certification EFSEC Docket Number: EF-210011. February 2021, Revised December 2022.
Tetra Tech, Inc. 2021. Economic Impact Assessment of the Horse Heaven Wind Farm. Appendix J.
O&M = operations and maintenance

The Application for Site Certification states that construction workforces for Phases 1, 2a, and 2b would vary over the course of the construction schedule. The following summarizes the low, mean, and high workforce estimates for each conceptual construction phase:

- Construction for Phase 1 is estimated to take place over an 11-month period. On-site activities would employ an average of 300 workers over the 11-month construction period. Viewed by month, on-site employment would range from a low of 26 workers to a high of 467 workers.
- Construction for Phase 2a is assumed to take place over an 11-month construction period. An estimated average of 267 workers per month would be employed over the 11-month construction schedule, with estimated monthly employment ranging from a low of 22 to a high of 430 jobs.
- The construction period for Phase 2b is assumed to be 10 months. An average of 271 workers per month would be employed over the 10-month construction period, with estimated monthly employment ranging from a low of 35 jobs to a high of 412 jobs (Horse Heaven Wind Farm, LLC 2022).

The economic impact of the Project's construction phase for Phases 1, 2a, and 2b are summarized for Benton and Franklin Counties in **Table 4.16-1B**. These estimates are one-time impacts for the 11-month construction period developed using the IMPLAN modeling software and 2019 IMPLAN data for Benton and Franklin Counties.

Table 4.16-1B: One-Time Construction Impacts

Construction Phase	Impact	FTE Jobs	Labor Income $ (million)	Economic Output $ (million)
Phase 1	Direct	171	19.4	19.4
Phase 1	Indirect	168	11.1	30.7
Phase 1	Induced	118	6.5	20.5
Phase 2a	Direct	152	17.2	17.2
Phase 2a	Indirect	199	13.8	35
Phase 2a	Induced	120	6.6	20.8
Phase 2b	Direct	136	15.7	15.7
Phase 2b	Indirect	269	18.8	46.7
Phase 2b	Induced	135	7.4	23.4

Sources:
Horse Heaven Wind Farm, LLC. 2022. Horse Heaven Wind Farm Washington Energy Facility Site Evaluation Council Updated Application for Site Certification EFSEC Docket Number: EF-210011. February 2021, Revised December 2022.
Tetra Tech, Inc. 2021. Economic Impact Assessment of the Horse Heaven Wind Farm. Appendix J.
FTE = full-time equivalent

The economic impact of the Project's operations phase for Phases 1, 2a, and 2b for Benton and Franklin Counties is summarized in **Table 4.16-1C**. These estimates are annual average impacts based on estimated operations and maintenance expenditures for a 35-year period of operation.

Table 4.16-1C: Annual Operational Impacts on Employment and Income

Construction Phase	Impact	FTE Jobs	Labor Income $ (million)	Economic Output $ (million)
Phase 1	Direct	11	1.0	1.0
Phase 1	Indirect	12	0.9	3.0
Phase 1	Induced	9	0.5	1.5
Phase 2a[(a)]	Direct	9	0.8	0.8
Phase 2a[(a)]	Indirect	9	0.7	2.2
Phase 2a[(a)]	Induced	7	0.4	1.1
Phase 2b[(a)]	Direct	9	0.8	0.8
Phase 2b[(a)]	Indirect	10	0.9	3.2
Phase 2b[(a)]	Induced	7	0.4	1.3

Sources:
Horse Heaven Wind Farm, LLC. 2022. Horse Heaven Wind Farm Washington Energy Facility Site Evaluation Council Updated Application for Site Certification EFSEC Docket Number: EF-210011. February 2021, Revised December 2022.
Tetra Tech, Inc. 2021. Economic Impact Assessment of the Horse Heaven Wind Farm. Appendix J.

[(a)] = Operational workforce estimates are based on if only Phase 2a or 2b were constructed. If both Phase 2a and 2b are constructed the estimated operational employment impact (direct, indirect, and induced) would range from 24 to 26 FTEs.
FTE = full-time equivalent

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